The Chemical Age

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Notes and Comments

Accidents on Pay-days

AT intervals during the last five years the managements of the various groups under the control of Imperial Chemical Industries, Ltd., have kept records with the object of discovering the days in the week and the time of the day at which accidents are most frequent. Investigations by Government officials during the war seemed to show that there were definite days and times when workers were more prone to accident or fatigue or both, but it seems so far, from I.C.I. figures, that there is no such tendency in the company's works, even where conditions are comparable. There is still, however, a great deal of interest in this point and the August issue of the I.C.I. Magazine records that recent investigations in one large I.C.I. factory have shown that most accidents happen on pay-day. This might easily have been another of those coincidences which crop up regularly to confuse the accident investigator, but it so happened that the pay-day at this works was changed. The bad accident day then immediately shifted to the new pay-day.

"Bad accident day" is, actually, an exaggeration, since the works concerned has very few accidents and has several accident-free records of hundreds of thousands of hours. Of the many theoretical explanations which might be given, it seems likely, says the Magazine, that the most plausible is that the thought of the delights of pay-day takes part of the mind off the job. Many road users know that there are times when they have some problem on their mind when they feel less safe than usual. The right kind of road-user takes extra care, concentrating more deliberately on the road and trying to put the problem out of his mind until he arrives at his destination. There may be something of the same influences at work on the accident figures in industry. At all events the safe motto is "Keep the mind on the job."

The Heavy Oil Tax

THE new tax of 8d. per gallon on heavy oil fuel which came into force on August 1, will bring even more revenue to the Treasury than was at first anticipated. Diesel oil was formerly taxed at 1d. per gallon. The increase was announced in the Budget speech. The use of Diesel engines is growing. At the last census on May 31 the number in use was 9,498—5,178 goods vehicles and 4,320 passenger—against 6,700 in September, 1934. Beteween 200 and 300 new heavy-oil vehicles appear each month. The London Passenger Transport Board now has 800 'buses of this type; it is adding six or eight a week, and all its new 'buses are Diesel-engined. Gradually the entire fleet of about 6,000 vehicles will be using heavy oil fuel in place of petrol. The average annual mileage of a London 'bus is 50,000. London Transport estimates that on its present fleet the net result of the heavy-oil tax will be an increase in costs of £55,000 a year—nearly £70 for each vehicle. The total, of course, will increase as more heavy-oil engined 'buses are put into commission.

Although the great artificial advantage hitherto enjoyed by the Diesel, with fuel at 5d. or 6d. per gallon, against petrol at 1s. or 1s. 1d., will now disappear, it still retains its inherent advantage of lower fuel consumption per ton-mile. The effect of the new taxes on goods vehicles is said to be this: the 5-ton Diesel vehicle has hitherto shown a profit on operating costs against a 5-ton petrol vehicle, provided its annual mileage was 17,000; in future it must do 22,000 miles a year to be profitable. As the annual mileage of the average commercial vehicle is in excess of these figures the development of the Diesel engine will not be seriously checked.

The Chemist and the Ship-builder

SHIP-BUILDING and chemistry seem at first glance to be a long way apart; it would almost seem impossible that they should descry one another over the horizon. The annual meeting of the Society of Chemical Industry showed that even in this branch of engineering the services of chemistry is now being invoked. Commander Bedale reminded us that 99 per cent. of the effective ships in the Navy, submarines excepted, are now propelled by highly-forced steam plants which relied upon a number of chemical processes, instruments and tests for their efficient performance. The evaporator is a recent, though exceedingly important introduction into the Navy. Air-conditioning in submarines is receiving attention. The subject of anti-corrosive and anti-fouling paints is one where the chemist closely touches the economics of seamanship; it was surprising to hear that the Royal Navy alone spend some £150,000 a year in dry-docking ships to remove barnacles which put a brake upon the progress of a hull through the water and thus cause extra fuel to be burnt. The Navy is still calling upon chemistry for more aid. It has no oil detector; it needs better means for ascertaining the presence of poisonous and inflammable gases; it desires to observe continuously the oxygen content of feed water, and so do many land boiler stations; there is no method of descaling tubes *in situ*, and the ancient problem of under-water fouling needs a good deal more elucidation.

So much for the mariner; the ship-owner has need of the chemist in many other ways, notably in the transport of goods. Dr. A. J. M. Smith pointed out that it was not until chemical refrigeration was brought out in 1877 that foodstuffs could be transported from distant lands. The implication of this one achievement of the chemist and physicist is staggering. Upon transport depends the feeding of our huge population—density; this country could never have achieved its present standard of living if it had not been possible to transport foodstuffs; many foods, both fruit and meat, could never have been tasted by us. The chemist has now gone a step farther and the chilled, as distinguished from frozen, method has come to the fore. Modern gas-storage methods are taking the place of the freezing methods. Dr. Smith speculates on the future possibilities of atmospheric control of ship's holds. Different cargoes require different methods of refrigeration, so that the equipment must be flexible; at the same time no ship could be a specialised carrier of a single cargo. "Will gas-storage methods for chilled beef," he asked, "be applied to other cargoes and to the South American meat trade; must the ship-owner contemplate with some apprehension a future in which every cargo-space has its controlled atmosphere and every ship its gas engineer?" We confess that that is not a future we view with any particular apprehension. The storing of foodstuffs and particularly in a tropical climate is not a job for the unlettered sailor-man; it is a job for the expert, and there is more hope for the future of British shipping now that it is beginning to show signs of doing its business in a scientific manner than there was not so many years ago. The British seaman is second to none; we hope the British ship-owner will prove at least as willing to engage skilled technical assistance as is his business prototype ashore.

Financing the Smaller Inventor

FROM time to time distinguished inventors and business men, recalling their earlier struggles, describe the difficulties in which they were placed by lack of finance. The financing of inventions, however, is but one phase of a much larger problem—the financing of all smaller businesses. Those who have had occasion to "go to the City" for capital find that there is a no man's land between boundaries of £5,000 and £100,000 within which it is most difficult to obtain capital for industrial purposes. Below £5,000 it is not unduly difficult to find someone with capital who will adventure this sum; above this the wealthy individual or smaller capitalist drops out and the company promotors are not interested until the sum needed approaches £100,000. Above this upper limit a share issue to the public can generally be arranged provided the necessary conditions are met. This position has two detrimental features. The first is that many perfectly good and genuine ventures needing perhaps £50,000 are never started because with the greater capitalisation needed to float a public company the profits expected would not be sufficient to pay dividends and the promotors, being honourable men, go no farther rather than mislead the investors. The other disadvantage is that certain ventures that would have been perfectly satisfactory, if started on a moderate scale and allowed to expand slowly, are "pitchforked" on to the largest scale immediately by flotation of a largely capitalised company—and the investing public pays the piper when the child is set to work before it is past its teething troubles.

The chemical industry in certain directions is a good field for the small business making a few products very efficiently, even though it is becoming more and more a business of large combines. Especially is the chemical industry noted for new inventions and it is not always the best policy to offer new inventions to large established concerns. It is clear, moreover, that to invest money in an invention or in a small business, especially in a new small business, is to take a risk; the affair is frankly speculative, and is therefore unsuitable for the activities of the banks, who are the guardians of their depositors' money, not a never-failing source of funds for industry. In many instances, moreover, it is not the amount of capital needed that is the difficulty, nor is it lack of security; the bar lies in the difficulty of marketing securities of a small concern should it become necessary to realise the cash. It matters not whether the concern is established or embryonic, good or bad; several undertakings, sound and promising, have gone to the wall because of this one factor. It has been suggested that a trust company should be formed mainly to invest in "unquoted" securities; these are primarily shares of debentures of small concerns and such a trust, it is felt, would greatly assist to smooth away the capital difficulties of many of these smaller businesses.

Directors Who Lack Knowledge

Whilst upon this subject, there is a kindred one which may well be ventilated; such a trust company would have to watch the affairs of the concerns in which it invested by directors appointed for the purpose. We are told "on good authority" that "it is notorious that in the City there is never an excessive supply of the right kind of men sufficiently equipped with expert knowledge of affairs to fill the constantly growing number of responsible directional positions, and that therefore such men as are available frequently are obliged to take on themselves far too many responsibilities." The trouble is doubtless that "the City" is not a good training ground for those who should have "an expert knowledge of affairs." Affairs in the City are far removed from the affairs of practical business men and manufacture, and undoubtedly if directors were more often appointed by reason of their knowledge of the business they have to control and less by reason of financial and legal knowledge, the state of many businesses would be very different to-day. Many who are on directorates will bear out our statement that the percentage of those who draw directors' fees and who do not do anything commensurate is surprisingly high. That is nothing to their discredit; after all it is an exceptional man who, knowing absolutely nothing about a business, can attend a board meeting monthly, or even quarterly, and contribute anything really useful to the proceedings. We believe the chemical industry is in general more free from such directors than most, but we cannot refrain from once again recalling the true story of the board of a chemical manufacturing concern that refused to appoint a certain eminent chemist to be one of their number, on the ground that he knew so much more than they that he would inevitably dominate the proceedings and always get his own way.

Plant Constructional Materials on the Continent

German Experts Review Present-Day Trends

In a paper on the influence of vacuum on the selection and resistance to corrosion of constructional materials, read before the Deutsche Gesellschaft für chemisches Apparatewesen E.V., at Königsberg, July 3-5, Mr. E. L. Holland-Merten, of Erfurt, pointed out that in most concentrating, drying and distillation processes vacuum was usually employed in the past only for reasons of economy or for securing maximum quality. There was now a tendency, however, to exploit the possibilities of vacuum operation in selecting constructional materials. The low working temperatures of vacuum processes are themselves a corrosion-preventing factor; oxidation-corrosion is also eliminated. With suitably designed plant, the low condensation temperature prevents attack upon those parts of the plant exposed to vapours, thus permitting use of less costly materials like iron. The more costly materials of construction can thereby be reserved for the sections coming into contact with liquids (the heating surface), if they cannot be entirely dispensed with by exploiting the Leidenfrost phenomenon. This is feasible if formation of vapour zones between heating surface and material during thin film evaporation prevents direct contact. Finally, the use of a reaction temperature below the melting point of the material under treatment often avoids reaction in the liquid phase and consequently prevents corrosion of simpler constructional materials.

Acid-Resisting Stoneware

Surveying the subject of acid-resisting stoneware in the chemical industry, Dr. K. Dehne, of Weisswasser, pointed out that stoneware is a product which is now produced in exceptionally good quality. It is naturally resistant to corrosion, while other properties essential in chemical processes have been considerably improved. With the aid of lantern slides he gave a comprehensive sketch of the very wide scope of this material. Of particular interest were his remarks on stoneware produced in vacuum, which is superior in many respects to stoneware produced by older methods.

Dr. Ing. H. Jungbluth, of Essen, dealt with the subject of castings in ferrous materials for chemical plant construction. Speaking generally, he said four main types of cast materials are available. The first type embraces alloys containing 14 to 16 per cent. of silicon, examples being Thermisilid, Tantiron, Wegucit, Sisteisen and Duriron. The mechanical strength of these materials is not particularly remarkable, a bending strength of 10 to 20 kg. per sq. metre and a hardness of about 300 Brinell units being usual figures. Better mechanical properties are achieved with alloys on a chrome iron basis containing 13 to 15 per cent. of chromium. Here a distinction must be drawn between the cast steel and the cast iron type. The corrosion-resisting steel-like alloys alloyed with chromium alone have not made headway against the nickel-chrome alloys or those on a cast iron basis with a high carbon content (1 to 2 per cent. of carbon and 34 to 35 per cent. of chromium). In the case of nickel-chrome alloys a distinction must again be drawn between those on a cast steel and those on a cast iron basis. The former contain 18 per cent. of chromium and varying carbon contents, whilst the latter contain about 1.5 per cent. of carbon, 6 per cent. of nickel and 25 per cent. of chromium.

A New American Alloy

A new American development is an alloy on the basis of cast iron, nickel and copper, which was originally obtained by mixing 2 parts of grey cast iron with 1 part of Monel metal. This was the so-called Nimol cast iron. The class has now been developed into the Ni-resists by the addition of other alloy elements. The proportions are now 2 to 4 per cent. of carbon, 5 to 35 per cent. of nickel, 2 to 8 per cent. of chromium, 2.2 to 16 per cent. of copper, 3 to 10 per cent. of manganese, and 3 per cent. of aluminium. The chromium content must always be lower than that of the nickel. Such materials are excellent cast alloys and in their acid resistance rival the bronzes for which they partially form a complete substitute.

Speaking of aluminium, Mr. H. Röhrig, of Lautawerk, said methods for using clay as a raw material for aluminium in place of bauxite have now been elaborated and have been found to yield metal of equally good quality. In fact, the production of aluminium in high degree of purity has made considerable progress in the last decade, in which work Germany has played a leading part. Refining processes are available whereby aluminium of 99.995 per cent. purity can be produced. The physical condition of the metal is of fundamental importance for chemical resistance. At high temperatures intermediately- and softly-annealed pure aluminium sheets always possess superior stability. It was pointed out that with the aid of small proportions of inhibitors, substances attacking aluminium can often be rendered innocuous to a surprising degree.

Special Steels

Dealing with special steels in chemical engineering, Dr. Ing. H. J. Schiffler, of Düsseldorf, based his remarks on the standpoint that inclusion of aluminium or silicon or both elements together in chromium steels in the absence of nickel imparts such valuable properties as high forging stability, resistance to attack by sulphur-containing and other corrosive gases, and non-reactivity of the protective layers. The drawbacks of these steels, including the low heat resistance and the cold-embrittlement of certain varieties, can be obviated by suitable constructional measures. A detailed account was given of the formation of protective layers. Boilers, oil-cracking plant, hydrogenation plant, ammonia synthesis and formaldehyde manufacture were typical instances of the application of special steels. New possibilities of dispensing with copper, brass, nickel and highly-alloyed nickel-chromium steels are offered by the production of double-walled tubes. The value of chromium-aluminium-iron alloys as substitutes for chromium-nickel steels in many chemical processes was stressed.

Dr. Th. Frantz, of Jena, in a paper on the use of quartz as a German material for chemical plant construction, said that maximum purity of the silica is desirable. Being unattacked by practically all acids and many reagents, fused quartz is widely used in laboratories and chemical works. In the laboratory it frequently replaces platinum and other precious metals; in chemical works it is used in the construction of pipe-lines, hydrochloric acid absorbers, sulphuric acid concentrating vessels, and pumps. Its excellent electrical properties account for its use in electrochemistry and electrical mist precipitation.

Synthetic Materials

Progress in the application of artificial materials of construction were reported in a joint paper by Dr. E. Czapek, of Berlin, and Dr. J. Reikstötter. Older plant materials like wood, metal, glass, and clay possess certain obvious defects, but synthetic materials often solve the constructional problem. Examples were given of applications of cellulose derivatives and condensation or polymerisation resins. With the aid of lantern slides the wide scope of the materials now available and the simplicity of the constructional methods involved were shown. The importance of corrosion prevention was discussed, together with the interesting possibilities arising out of elimination of the influence of constructional material —formerly unavoidable—in plant used for many chemical processes.

Modern material problems in the chemical industry, chiefly in connection with non-ferrous metals, were reviewed by Dr E. Rabald, of Mannheim. With the aid of informative diagrams he outlined the benefits which would accrue from adoption of various non-ferrous metals. Stress was also laid upon the importance of investigating the influence of small proportions of accessory substances upon the chemical and physical properties of the materials.

The profits for the year 1934 reported by the Office Cherifien des Phosphates in Morocco amounted to 55,767,377 francs, compared with 49,482,175 francs for 1933. Deliveries effected by the Office Cherifien totalled 1,426,796 metric tons as compared with 1,266,796 metric tons.

New Indispensable Amino Acids

By MADELYN WOMACK

Abstract of a Thesis submitted in partial fulfillment of the requirements for the Degree of Doctor of Philosophy in Chemistry in the Graduate School of University of Illinois, 1935

THERE are three methods in general use for studying the relation of amino acids to maintenance and growth. One is to feed a protein devoid of, or deficient in, one of these components; the second is to feed a hydrolysed protein from which one or more of them have been removed as completely as possible; and the third is to feed a mixture of purified amino acids. The possibilities of determining the nutritive importance of amino acids by the first two methods are quite limited. Of the twenty known protein components, only four, namely, lysine, tryptophane, cystine and histidine, were shown to be essential.

The feeding of purified amino acids seemed to be of little value in studying the nutritive importance of the individual components because no one had succeeded in obtaining growth on such mixtures. However, Ellis and Rose (2) found that if a mixture of nineteen amino acids is supplemented by 5 per cent. of casein, gelatin, or gliadin, the animals lost weight for four days and then slowly gained. This was interpreted as evidence for the existence in proteins of a hitherto unrecognised essential dietary component. Windus, Catherwood and Rose (4) have shown that this substance is present in the monoamino-monocarboxylic acid fraction of hydrolysed proteins. If concentrates of this material are incorporated in a diet otherwise adequate, except for the absence of a single amino acid, one would expect to create a deficiency, provided the amino acid in question is indispensable. Using this method, experiments have been conducted to determine the nutritive importance of certain known amino acids.

Structural Similarity

The structural similarity of phenylalanine and tyrosine suggests the possibility that they may be mutually interchangeable in metabolism. Other investigators have presented evidence both for and against this idea. Abderhalden (1) reported that isoleucine and norleucine may be dispensed with, provided leucine is present in the rations. However, the interchangeability of the three compounds seems highly improbable in view of their structural dissimilarity. The nutritive value of the three amino acids has also been investigated.

The first prerequisite in determining the role of phneylalanine and tryrosine in nutrition was to prepare a concentrate of the unknown growth essential. Casein was hydrolysed in the usual fashion and a large fraction of the less-soluble amino acids was removed. The *p*H of the solution was reduced to 3.0 by the addition of sulphuric acid, and seven butyl alcohol extracts, which removed only traces of activity, were made. The sulphuric acid was removed with barium hydroxide, and eight butyl alcohol extractions were carried out on the filtrate. The amino acids so obtained were converted to their copper salts and extracted with water. The copper was removed from the water-soluble copper salts, and the filtrate was treated with sufficient absolute alcohol to make the resulting concentration 90 per cent. by volume. The precipitate was filtered off, and the filtrate was concentrated to dryness in vacuo. The material so obtained constituted our "active fraction."

This concentrate was added as a 3 per cent. supplement to a diet containing purified amino acids, fats, carbohydrates, minerals and vitamins. The results show that the absence of both tyrosine and phenylalanine from the foods leads to nutritive failure, while the presence of both results in very satisfactory growth. However, the animals which received added phenylalanine alone grew just as well as those which were supplied with both amino acids. The replacement of the phenylalanine of the diet by tyrosine was followed invariably by a rapid loss in body weight.

In investigating the nutritive importance of the leucines, fibrin was used in preparing the concentrate of the unknown growth essential. The protein was hydrolysed in the usual manner, and a fraction of less-soluble amino acids was removed. Eight butyl-alcohol extractions were made on the filtrate, and the first one was discarded. The amino acids from the other seven extractions were converted into their copper salts. The amino acids were recovered from the water-soluble copper salts, and when thoroughly dried were used in 3 per cent. concentration as a supplement to the diets.

The absence of the three leucines from the ration leads to complete nutritive failure. Likewise, the presence in the ration of only one of the leucines leads to an equally rapid loss in weight. If all three amino acids are present, very excellent growth ensues. However, isoleucine and leucine, without the addition of norleucine, induce a similar increase in weight. From these results we can unhesitatingly say that both leucine and isoleucine are necessary dietary components, and that the absence of either from the ration leads to complete nutritive failure.

By the use of a mixture of highly purified amino acids, supplemented with a concentrate of the unknown growth essential, definite proof has therefore been secured for the indispensable nature of phenylalanine. Under the conditions employed, tyrosine is totally incapable of replacing phenylalanine in the food. Using the same method, it has been demonstrated that leucine and isoleucine are indispensible amino acids. Probably norleucine is not necessary for normal nutrition.

Feeding Experiments

Feeding experiments (3) have shown that rats fed on a diet in which the protein is replaced by a mixtuer of the generally recognised amino acids, lose weight. However, if this mixture is supplemented by 5 per cent. of casein (2), or by the monoamino-monocarboxylic acid fraction of hydrolysed protein (4), the animals grow normally. This indicates the existence in proteins of a hitherto unrecognised dietary component. Work has been in progress on the preparation of active concentrates in the hope of isolating this new amino acid in pure form and determining its structure.

Since apparently the growth essential is slowly soluble in butyl alcohol, it appeared possible to effect a concentration by re-extracting a solution of the butyl alcohol-soluble amino acids once or twice with additional portions of the solvent.

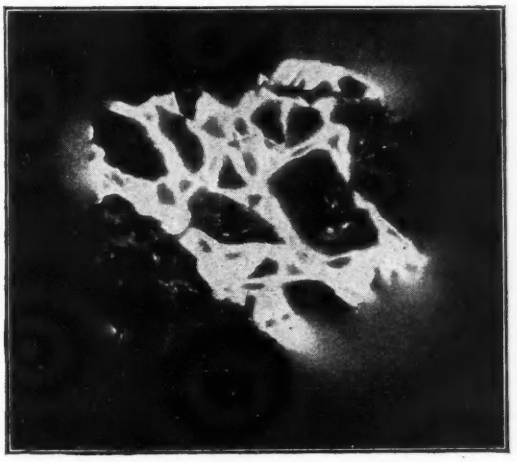
Hydrolysed fibrin from which a fraction of the less-soluble amino acids had been removed was extracted twenty-two times with butyl alcohol. Fractions 7-22 were dissolved in water, and re-extracted with butyl alcohol. The amino acids remaining in the water solution were converted into their copper salts. After removing the copper from the water-soluble salts, a fraction of the less-soluble amino acids was removed. The filtrate was concentrated to dryness in vacuo. The amino acids from the water-soluble copper salts should have had a high activity. However, when they were fed as a 4 per cent. supplement to an otherwise adequate ration, an average total gain of only 13 gm. in 24 days ensued. Rats fed on the material from the first re-extraction with butyl alcohol manifested gains of 1.3 gm. for the experimental period. On the other hand, animals which received 2 per cent. of each of the above fractions gained 29 to 36 gm. each. It can therefore be seen that the active material had been separated into two portions, one readily soluble, and the other more slowly soluble in butyl alcohol.

Since there was a possibility that the active component of one or both of the fractions might be a known compound, the growth-stimulating effect of various amino acids was tried in place of one or the other of the two unknowns. It was quickly discovered that isoleucine, fed with the fraction from the water-soluble copper salts, produced very satisfactory growth. It is evident, therefore, that of the two unknown compounds, the one which is more soluble in butyl alcohol is isoleucine. The less-soluble product is not one of the usually recognised amino acids.

(1) Abderhalden, E., Arch. ges. Physiol., 1922, *195*, 199.
(2) Ellis, R. H., and Rose, W. C., J. Biol. Chem., 1931, *94*, 167.
(3) Rose, W. C., J. Biol. Chem., 1931, *94*, 155.
(4) Windus, W., Catherwood, F. L., and Rose, W. C., J. Biol. Chem., 1931, *94*, 173.

Radium Discoveries in North-West Canada

By Hugh S. Spence *



Radiograph of siliceous type pitchblende ore from No. 3 vein, LaBine Point. The pitchblende (light) occurs as the filling surrounding brecciated rock fragments (dark) of a sheared break.

THE important discoveries of pitchblende by Gilbert LaBine, in 1930, at what is now LaBine Point, on the eastern shore of Great Bear Lake, in the sub-arctic region of Canada, have attracted world-wide attention. The world known deposits of radium-bearing minerals, sufficiently rich and extensive enough to be considered commercially, are relatively few. Up to now, the most important are Czechoslovakia (where there are pitchblende veins in the Joachimsthal district), England (veins in the Camborne district of Cornwall), Portugal (the autunite and torbernite deposits of the Serra d'Estrella region), United States (carnotite deposits situated in Colorado and Utah and pitchblende deposits of Colorado), West Africa (deposits of pitchblende and its alteration products in the Belgian Congo), Madagascar (pegmatitic minerals, both euxenite and betafite, as well as the autunite deposits), South Australia (autunite and torbernite deposits of Mount Painter), and Russian Turkestan (the tyuyamunite deposits). All these regions have furnished ore for the extraction of radium during the last three decades, though the American carnotites and Belgian Congo pitchblende and oxidation products have accounted for the greater part of the production of the element radium.

Pitchblende, which is essentially uranium oxide (U_3O_8), and generally a mixture of UO_2 and UO_3, is the richest ore of uranium (and consequently of radium) known. Theoretically in the pure state, *i.e.*, 100 per cent. U_3O_8, it should contain an equivalent of 260 milligrams of radium per ton, or a little over one gram in four tons Mixed with gangue minerals, as it invariably is, the usual grade as mined, seldom runs half as high as this figure and generally much lower. Under very favourable economic conditions, the lowest U_3O_8 content for a commercial ore, without resorting to concentration, would probably be in the region of 15 to 20 per cent. For years the Czechoslovakia State refinery ran on hand-picked cobbled ore, of which some 50 tons per annum were treated, giving a yield of about 2 grams of radium. Latterly, modern concentration methods have been employed, but the grade attained is not known.

Radiograph of carbonate type pitchblende ore from No. 2 vein, La Bine Point, showing broken-up fragments of botryoidal pitchblende crusts (light) in a carbonate matrix (dark). The nature of the white specks has not been determined ; they may be native silver rendered radioactive by a deposit of polonium.

Concentration methods are not always effective, owing to the brittle nature of the mineral, and its tendency to slime during fine grinding in order to free it of its intergrown gangue, usually of a hard, siliceous nature. Slimes cannot be successfully tabled, and pitchblende does not respond to flotation methods. As far as tonnage-grade-of-ore is concerned, the Great Bear Lake pitchblende is generally believed to be the richest known. Samples taken by the writer from surface pits over a vein length of 1,400 feet showed as high as 62 per cent. U_3O_8 in analysis. Cobbing and hand-picking would probably produce an average of between 40 and 50 per cent. Recent reports from the Eldorado mill at LaBine Point, which came into operation early in 1934, show a steady production of table concentrates containing around 60 per cent. U_3O_8 is being achieved. These concentrates run 10 to 20 mesh : but a satisfactory means of treating the slimes made, to completely unlock the pitchblende from its admixed gangue has not yet been found, though this problem is being studied and hopes are entertained for its successful solution.

Shipments of ore to the Eldorado Refinery at Port Hope, Ontario, have to date totalled approximately 60 tons, most of which were shipped before the concentrator at the mine started up, and consisted of hand-picked ore. Probably most of the ore in future will be concentrated at the mine, without any picking. This procedure is necessary in order to make as high grade a product as possible to save freight charges, the most important consideration in view of the distance ore has to be transported to rail some 1,500 miles. A further reason is that much of the ore contains leaf silver, which causes difficulties in the refining process, that can be removed by flotation.

Work at LaBine Point has demonstrated the existence of extremely important deposits of pitchblende. The average grade of mine-run-ore is usually rich for this mineral, and three months' operation of the Eldorado Company's mill has shown that a shipping product can be successfully made carrying some 60 per cent. U_3O_8, equivalent to a radium content of one gram per 6½ tons. Such a grade of product constitutes a raw material as has seldom, if ever, been approached in

* Reprinted, in abbreviated form, from "Sands, Clays and Minerals," June, 1935.

regular commercial practice. When it is remembered that the average grade of the carnotite concentrates formerly treated in the United States for the recovery of radium was under 3 per cent. U_3O_8 (radium equivalent 1 gram in 128 tons), and that the best grade of Belgian Congo ore is stated to have averaged 1 gram in 10 tons; while in recent years the grade is said to have dropped to 1 gram in 30 to 40 tons, the value of the Great Bear Lake development becomes readily apparent.

The occurrence of native silver, often in large amounts, with the LaBine Point pitchblende gives additional value to these discoveries. Some of the ore is extremely rich, assays up to 9,000 oz. silver per ton having been obtained on large vein pieces. Shattered rock of the entire shear-zone also carries values in silver, the metal being present as thin leaves on the joints, and is looked upon as milling ore. The average grade is stated to be some 100 oz. per ton. A recently-erected concentrator was designed primarily for the recovery of

One of the pits on No. 2 vein at LaBine Point, with Gilbert LaBine, discoverer of the Great Bear mineral field, in foreground.

silver, and not for treatment of pitchblende, but concentration results on the latter have proved so successful that a separate unit is to be assigned to this work.

The Eldorado mill, which commenced running late in 1933, is the first concentrator to come into operation at Great Bear Lake. It has a capacity of 50 tons per day and is operated by a 60-h.p. Diesel engine, running on crude oil obtained from a well 300 miles to the west. The oil well was drilled during the 1921 boom, but remained closed down until 1932, when it was re-opened to supply both fuel-oil and gasoline for Great Bear mining operations and transportation purposes. Grinding at the plant is effected by a rod-mill and the coarse silver recovered by tabling, the fine by flotation. Pitchblende, as already stated, is concentrated by tabling, with the recovery of 10 to 20 mesh products. The present mill capacity will shortly be increased to 100 tons.

Following the discoveries at LaBine Point in 1930, a large influx of prospectors came into the region during the 1931 season, most of them using aeroplane transportation. Thus far, pitchblende has only been definitely reported from two other groups of claims in the Great Bear Lake region proper. One of these groups, owned by the Consolidated Mining and Smelting Co., adjoins the Eldorado LaBine Point property to the east, and the occurrence is probably part of the same vein-system.

Great Bear Lake is no small body of water. Having an area of nearly 11,000 square miles, it is the largest lake in Canadian territory and the fourth largest on the North American Continent. It lies in a vast, sparsely-timbered wilderness, directly on the arctic circle. To the east is the vast treeless expanse of the so-called Barren Lands. Previous to 1930 this region was practically unknown territory, inhabited only by a handful of Indians, trappers and fur-traders. When the remoteness of the region, difficulties of transportation and shortness of season during which prospecting can be carried on are considered, the developments achieved to date are highly encouraging. The aeroplane has in a large measure been responsible for the rapid progress made, enabling both men and supplies to be transported in a few hours over distances that formerly required weeks of arduous travel by water. Usually, Great Bear Lake is not free from ice until July, and the open season for water transport is a brief three to four months, closing again in October. Aeroplanes can operate, however, all the year round, except for a few weeks in the spring and fall during the freeze and break-up periods, being equipped with pontoons in summer and skis in winter.

The Eldorado Company's radium refinery is located at Port Hope, Ontario, a small town about 50 miles east of Toronto. Including the 1,500 miles of water transportation from Great Bear Lake to Waterways, the total freight distance from mine to refinery is 4,000 miles. Inclusive freight charges total about $115 per short ton.

Treatment consists in first crushing the ore to ¼ inch, after which it undergoes a preliminary roasting process to remove sulphur from the contained sulphides and carbon dioxide from the carbonate gangue. As the ore is now crushed and concentrated at the mine, no initial crushing at the refinery is necessary. After roasting, the ore is reduced in a rod mill and screened to 35-mesh, when it is ready for chemical treatment. The initial chemical treatment consists essentially of first leaching in stoneware tanks with hot sulphuric acid, to which barium chloride is added; the radium precipitates with the barium as sulphate, together with the lead and silver. When leaching is complete, the charge is run off to settling tanks and the liquor filtered to remove solids. These, together with the leach residues, are washed to remove all traces of uranium, and proceed to the radium side of the refinery.

The leach liquors, to which the washings have been added, and containing the uranium in solution, are boiled with soda ash, which precipitates the impurities, leaving the uranium still in solution. The charge is then filtered, the residue discarded, and the liquor treated with sulphuric acid and caustic soda to form sodium uranate. After filter-pressing, this sodium-uranate cake is dried and pulverised, the filtrate being discarded. Leach residues, containing radium, barium, lead and silver as sulphates, are boiled with soda ash, which converts the sulphates to carbonates. These are then filtered, the filtrate discarded, and the residue treated with hydrochloric acid. This converts the barium and radium to soluble chlorides, while the lead and silver chlorides are thrown down with the insoluble residue. After filtering, the latter is smelted for the recovery of the lead and silver. The filtrate is then treated with sodium sulphate, which throws down the barium and radium as sulphates. After filtering, these are again leached with a solution of sodium chloride, to remove traces of lead, and a final filtering leaves pure barium and radium sulphates ready for conversion into bromides by means of hydrobromic acid. Since barium and radium bromides differ in their solubilities they are finally separated by a prolonged series of fractional crystallisations.

This method of treatment supersedes that originally used, which involved the use of hydrochloric acid as a leaching agent. The latter necessitated separate processing of the carbonate and silica types of ore, as well as resulting in lower radium recovery and considerable loss of silver. Up to June, 1934, after some eighteen months' operation, the plant had treated 58 tons of pitchblende, from which 5½ grams of refined radium had been isolated. The production of uranium compounds is also an important item of the refinery operations, and substantial amounts of silver are recovered. To June, 1934, the output of finished uranium salts, chiefly sodium uranate and black uranium oxide, totalled 35,000 lb., whilst the silver recovered amounted to 30,000 oz.

Textile Bleaching with Hydrogen Peroxide

By G. D. PRATT

This paper was presented at the Canadian Chemical Convention, Kingston, June 1935. The author is associated with Canadian Industries, Ltd.

THE history of bleaching dates back to 1875, when, in France, barium peroxide was used for the preparing and treating of silk. Three years later, mention is made of hydrogen peroxide being used for the same purpose; and in 1882 we read of the addition of alkaline silicates, etc., to the bleaching bath. Progress since then has been rapid, thanks largely to improved methods of manufacture and the production of a stable high volume strength peroxide.

Bleaching with hydrogen peroxide is applicable to all types of textile fibres, and usually can be applied in any form from the raw stock to piece-goods. It is also applicable to union yarns, or fabrics containing wool and silk or silk and cotton, etc. Bleaching temperatures vary from 120° F. to the boiling point, depending upon the type of fibre to be bleached.

Stabilisers and Assistants

Hydrogen peroxide of 100 volume strength as received by the consumer is always slightly acid, but, to be of use as a bleaching agent, it must be in an alkaline solution. In wool bleaching, any of the ordinary alkalis can be used, such as ammonia, soda ash, etc.; but the best material for this purpose has proved to be sodium silicate. It is preferable to use sodium silicate of the ratio 3.2 silica to 1 of sodium oxide, and the bath is usually run at a pH value of about 8. Excess silicate is to be avoided, as it has a harshening effect on the wool and causes the peroxide to decompose more quickly.

In order to obtain a whiter bleach, a product known as Stabiliser "C" has recently been introduced for use in the bleaching of wool and silk with hydrogen peroxide. This product is a mixture of sodium pyrophosphate and sodium oxalate, and is used in place of silicate of soda where an enhanced white is required. The addition of the sulphonated fatty alcohols is also an advantage in peroxide bleaching, notably in the treatment of cottons, and products such as Gardinol and Igepon are widely used for this purpose.

For the bleaching of wool and silk a wood tank can be utilised, care being taken that no copper, iron or brass fittings are in contact with the peroxide solution. Wood, however, is attacked by peroxide and eventually goes pulpy and soft. The usual practice is to line a wooden tank with stainless steel, Monel metal, lead, or a coating of cement, all of which are impervious to the action of the peroxide solution. For piece-goods of wool, silk, cotton or unions the ordinary winch machine is often employed, and for woven goods the common jigger. For the bleaching of cotton, iron kiers are largely used, the kier being coated with a mixture of lime, cement and silicate to prevent iron stains during the processing. Cotton yarns are bleached either in the kier or in package machines.

Troubles Encountered in Peroxide Bleaching

One of the main sources of trouble in peroxide bleaching is metallic contamination in the bath. Small proportions of copper or iron in the bleaching liquor cause quick decomposition of the peroxide, and if textiles carrying copper or iron stains are immersed in peroxide the localised action is so violent that holes will result. Great care is therefore required to prevent these stains on goods which are subsequently to be peroxide-bleached.

In keeping a standing bath for the bleaching of wool yarn or piece-goods various forms of bacteria also cause difficulties. Certain types of bacteria bring about rapid decomposition of a peroxide bath, and there are cases where a one-volume bath has been completely decomposed with violent foaming in the space of a few minutes by the introduction of wool carrying such bacteria. These bacteria also thrive in the scum which collects in a peroxide bath from poorly-rinsed wool after scouring, and care should be taken when the bath is periodically cleaned out that all accumulation of scum and foam is cleared away before a new bath is prepared. In this connection it is advisable to wash out the tank with a very weak solution of sodium hypochlorite to effectively kill the bacteria. If the wool is also found to be contaminated with the bacteria, a pre-treatment with a very weak solution of hypochlorite is necessary before peroxide bleaching. Care should also be taken to see that all ingredients of a peroxide bath are thoroughly dissolved. For example, if the sodium silicate is not in complete solution it will adhere to the fabric, giving rise to stains and, in some cases, a burnt fabric.

A steeping process is employed to bleach wool knitting yarns. The bath contains from one to two gal. of 100-volume peroxide per 100 gal. of water. The temperature is raised by means of an enclosed steam coil in the suitably lined wooden tank to 120° F. The necessary amount of sodium silicate or Stabiliser "C" is added to give a pH of from seven to nine, and the whole is well stirred. The previously scoured skeins of yarn are then immersed in the bath, and held down by a tray placed over the top. Bleaching usually takes place overnight, and in the morning the yarn is lifted, squeezed and rinsed. The squeezing operation is important, in order to retain as much liquor in the bath as possible, as it is usual in this type of bleaching to keep a standing bath.

After a batch has been bleached it is found that the volume strength has dropped from one-third to one-half of the original strength, and therefore it is only necessary to replenish the bath with the proportionate amount of peroxide.

After rinsing, the yarn is dried, or in some cases is given a subsequent treatment in a sulphur stove or with sodium bisulphite. Some of the lower-quality yarns have a very brown natural colour, and, in addition to the oxidising action of hydrogen peroxide, require a reducing agent such as sulphur dioxide to produce a full white. Where yarns are to be dyed in bright or pastel shades it is usual to give a peroxide bleach first, as by this means much brighter shades can be produced. The use of Stabiliser "C" will often eliminate any subsequent sulphur treatment, and it is especially valuable where the yarn is to be afterwards dyed. As is well known, it is difficult to rinse sodium silicate out of wool, and very often streaky dyeings are obtained on wool bleached in a peroxide-silicate bath. Stabiliser "C," however, rinses out freely and therefore gives more level dyeings.

Cotton Yarn Bleaching

Cotton yarns are bleached with hydrogen peroxide either in the kier in skein form or in a package machine. In the bleaching of cotton skeins in the kier there are two methods. In the first, most of the natural fats and waxes in the cotton yarn are boiled out and removed before bleaching with peroxide. In the second method the two processes are combined. For very brown Egyptian yarns, where the most economical chemical cost is to be considered, it is better to give a preboil with a three per cent. caustic soda solution on the weight of yarn. The cotton skeins are packed into the kier either in bundles or, preferably, in chain form, and the caustic liquor is pumped over from an outside tank. Circulation is started by which the liquor is sucked out by a rotary pump from the well of the kier and sprayed over the top of the goods. The temperature is raised to the boil, and boiling continued for about four hours. The liquor is then drained away and the load washed with hot water.

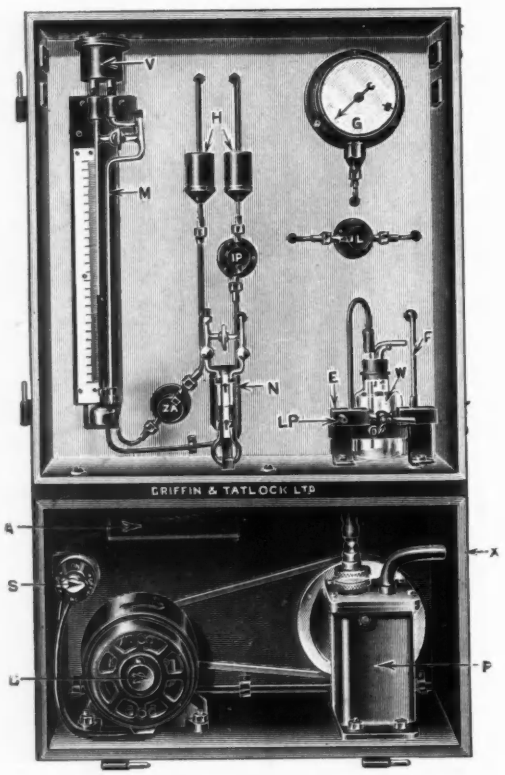
The bleaching liquor consists of from one-half to one volume strength hydrogen peroxide, silicate of soda 42° Be., to an equal weight of peroxide used, and the addition here of a sulphonated fatty alcohol such as Gardinol is found to be an advantage. The bleaching liquor at a temperature of 120° F. is pumped over the goods in the kier, and circulation started. The temperature is gradually raised during a period of one hour to about 200° F., and bleaching is continued for from six to seven hours. If tests are made of the volume strength during the bleaching process it will be found that during the first hour a considerable drop in peroxide strength takes place, after which the curve levels out and a gradual decrease takes place over the remainder of the process.

Where it is decided to bleach and boil in one operation it is necessary to use rather more hydrogen peroxide along with an equal amount by weight of sodium silicate. Caustic soda of an amount equal to from one-third to one-fifth of the weight of hydrogen peroxide used is also employed in this process.

The Fagelston Continuous Gas Indicator

Automatic Analysis for Industrial Gases

MANY developments of industrial processes involve the use of gases at both ordinary and high pressures, the composition of which is important to know. Care in reducing fire, explosion and other risks in handling inflammable and asphyxiating fluids and the necessity of operating solvent recovery, scrubber and similar plant in modern industry under the optimum conditions of performance have created a demand for instruments capable of following up the fluctuating composition of gas and vapour mixtures, the ordinary laboratory chemiral analysis of which is in many cases laborious and difficult. This demand is met by the continuous gas indicator developed by Mr. I. Fagelston, M.Sc., A.I.C., of the Admiralty Research Department, and protected by patent.



Fagelston Gas Indicator: Air Type

In the Fagelston indicator manufactured by Griffin and Tatlock, Ltd., the conditions of high sensitivity and stability under which it is designed to operate enable the composition of a mixture to be indicated in all except very special cases.

The continuous gas indicator has been developed in two standard forms which can be adapted to meet most requirements. These are known as the "air type" and "petrol type," and differ in the method whereby the standard comparison gas is provided in the instrument. In the air type of instrument (which is illustrated) air or some standard gas is drawn into the instrument from outside, while in the petrol type the comparison gas is made from the gas actually being analysed by removing the constituent it is desired to determine. The air type indicator may be used for either continuous indication or "spot" testing, and is ready for use within a few minutes of switching on, the lag of indication being about 50 seconds. The amount of gas used when running continuously is less than 1 cubic foot per hour. For continuous running, the driers can be supplied for either 40 or 100 hours of life before refilling.

Super-sensitive models of the air and petrol types have been developed for cases where it is desirable to indicate very low concentrations of a given constituent, and in these models an accurate spot determination of residual hydrocarbon vapours may be made in about five minutes.

The continuous gas indicator is of simple engineering design, transportable, and almost foolproof. A single determination can be effected within three minutes, and the accuracy of the indication is greater than that obtainable with the ordinary gas analytical methods. The indication is independent of vibration and of tilt of the instrument up to about 12° from the vertical. The instrument is extremely stable to changes in the conditions of operation.

The technical and scientific applications of the instrument include the manufacture, use and recovery of solvents; the petrol and oil industries; evaluation of the qualities of adsorbents; coal carbonisation; power gases and combustion control; synthesis of fuels and the organic chemical industries; industrial gases; gases in the heavy chemical industry; safety in connection with chemical and engineering plant; and the humidity of gases.

Rapid Weighings

A Useful Balance Attachment

THE "Grainger" chain drum balance attachment supplied by J. W. Towers and Co., Ltd., speeds up weighing as no fractional weights are necessary. It is an invaluable accessory for balances when accuracy to 0.005 grm. is sufficient. The attachment consists of an aluminium drum with a black non-corrosive finish, on which is fixed a white graduated scale. The drum is supported on a bracket with a clamp for securing to the balance pillar. Attached to the drum by one end, and wound round it, is an accurate machine-made chain, the other end of which is hung on a small clamp fixed to the lower side of the balance beam. The drum is graduated from 1 gramme in 160 divisions, which are nearly 2 mm. apart. Thus reading can easily be taken from the fixed pointer to 0.005 grm. Weighings are carried out by placing weights in the right-hand pan to the nearest gramme below the required amount. The beam is then raised and the drum turned, adding weight to the right-hand side of the beam until the pointer comes to rest in a central position.

This attachment meets a long-felt need in almost every sphere of scientific work. In the past, various expedients have been evolved to eliminate the use of fractional weights, both in schools and works, but until the advent of this attachment they were nearly all expensive and involved sending the balances to the works to have them fitted.

A New Recording Photometer

Suitable for Illumination from Any Source

THE "Autophotic" recording photometer, in addition to continuously indicating the actual value, provides a permanent record on a chart of the illumination from any source, whether electric, gas or daylight, at any desired point. It consists of a sensitive (test) surface embodying the Everett-Edgcumbe "Autophotic" cell used in conjunction with an Everett-Edgcumbe "Inkless" recorder. This cell generates a current exactly proportional to the quantity of light which falls upon it. It is placed in any position and connected by leads of suitable length to the recorder. The pointer of the latter norminally swings free of the chart and is pressed down periodically by a tapper bar operated by the chart-driving mechanism, the record being made from an inking ribbon inserted between the pointer and the chart. In this way, a continuous indication, as well as a permanent record, of the illumination is obtained. The scale on the chart is 4 in. wide and, since the chart is 65 ft. long, a record can be obtained for one month at a chart speed of 1 inch per hour. Other chart speeds from ½ in. per hour up to 12 in. per hour can be supplied if desired at an extra cost. The great advantage of the "Inkless" recorder is that the pointer is normally free from restraint. The instrument is supplied by Everett Edgcumbe and Co., Ltd.

An Acid-Resisting Cement of Outstanding Merit

Its Advantages over Ordinary Waterglass Cement

ASPLIT is a self-hardening and acid-resisting cement of synthetic resin nature, prepared by mixing a powder with a solution. At a temperature of 70° F. the mixed cement begins to set after about six hours and is hard and ready for use in about twenty-four hours. It is supplied by J. M. Steel and Co., Ltd., and presents several advantages over ordinary acid-proof waterglass cements. It is practically impervious to liquids, whereas all waterglass cements are to some extent porous. Its compressive strength is 12,000 lb. per square inch, which is four to five times that of the best waterglass cement; as an adhesive between brick and stoneware it will resist a pull of 150 lb. per square inch. It is not eroded by moving liquids and is therefore not washed out of the joints of pickling troughs, pipe linings, etc. Soda solutions, which have a solvent action on waterglass cements, do not affect work carried out with Asplit, which may also be used for "skimming."

The rate of setting varies considerably with variations in temperature. For instance, at 160° F. setting takes place within a few minutes, whereas at 50° F. it takes three days. At temperatures below 60/70° F. the hardening of the cement should be accelerated by gentle warming. The colour of the cement as it begins to harden is yellowish, changing to pink and finally to red, which indicates that setting is complete.

Asplit should be applied only to dry materials. Surfaces to which it is to be applied must be dried thoroughly; in the case of repair work, joints should be dried by means of compressed air. While the cement is hardening, moisture must on no account be allowed to reach the surface. If the surfaces to be covered are very warm, *i.e.*, above 85° F., it is advisable to apply a preliminary layer of thin cement composed of equal parts of powder and solution before the standard mixture is applied. Joints must be filled with Asplit cement to a depth of at least five-eighths of an inch. The recesses between the bricks must be at least a quarter of an inch in width, and rectangular in section; care must be taken to prevent the cement from being spread on the surface of the bricks.

Asplit mortar is applied direct to bricks, tiles and earthenware. Surfaces of glass and glazed tiles should, if necessary, be roughened by means of a sandblast or by being etched with hydrofluoric acid before the mortar is applied. It will be found advisable to apply to such surfaces a preliminary layer of the thin cement described above. Brickwork set in cement or waterglass cement, not soured by preliminary treatment, should be washed with a 5 per cent. solution of hydrochloric acid and then thoroughly dried before the mortar is applied. To apply Asplit to concrete or iron surfaces, special methods of working must be adopted.

Asplit cement-work is resistant to hydrochloric acid, sulphuric acid (up to 50 per cent.), sulphurous acid, phosphoric acid, oxalic acid, chloracetic acid and other organic acids to acid and salt solutions, acidified water, water, steam at temperatures not exceeding 355° F., soda solutions and ammonia. It is *not* resistant to nitric acid, caustic soda, hypochlorite, aniline and similar organic bases. Asplit cement-work is also resistant to some but not to all organic solvents. It is not resistant to alcohol or acetone without special treatment, but it does resist other solvents, such as benzine, benzole, methylene chloride, chlorbenzole, ether, etc. Its resistance also depends on the materials with which the solvents may be mixed; whether Asplit is suitable or otherwise for any particular purpose must be predetermined by tests. Work carried out with Asplit may be rendered resistant to alcohol or acetone by being heated to about 300° F., or by being soured with hot 40 per cent sulphuric acid. This treatment is even more effective if the Asplit mortar is prepared with an excess of Asplit solution, *i.e.*, at least 1 gallon of solution to 20 lb. of powder. A special Asplit powder is available, supplied only to order, which will resist hydrofluoric acid of a strength of up to 50 per cent.

Obtaining Immunity from Corrosion

Protective Coatings for Chemical and Allied Works

IT is not often that new materials meet with the widespread and rapid success that has been gained by the series of protective coatings marketed by Detel Products, Ltd. These products owe much of their rapid progress to the fact that Detel was originally made and marketed on a very small scale in order to give ample opportunity of proof of its remarkable powers of resistance under many and varied conditions. The experience gained in this way has proved invaluable, and, coupled with the easy demonstration of its immunity from attack by such intensely corrosive agents as strong acids, alkalies and spirits has, without doubt, contributed greatly to its ever-extending uses.

Detel, to which reference was made in THE CHEMICAL AGE, February 9, 1935 (page 124), is a clear liquid, in appearance not unlike an ordinary varnish, and is the basis of all Detel coatings (paints). These coatings can be made in any colour. The makers are not interesting themselves in particular with decorative coatings; their chief object being to supply a coating that is really anti-corrosive, and for this purpose they confine themselves to red, grey, white, cream and Detel aluminium. Their other products and metal undercoatings (pure metallic zinc and lead) and white undercoating come under a distinct category of their own.

Detel red may be regarded as "the paint for general purposes." It will resist the attack of acids and alkalies, of concentrations up to 100 per cent., including hydrochloric, sulphuric, nitric, chromic and acetic acids, caustic potash, soda and ammonia. It is also immune from attack by petrol, paraffin, lubricating oils, methylated spirit, alcohol, etc., as well as water, sea water and brine. The foregoing protection is also provided by Detel grey, white and cream, but not perhaps to quite the extent of acids and alkalies at 100 per cent. concentration. If greater protection is required than that outlined above, it is best attained by one coat of clear Detel (pure Detel) over two coats of a pigmented Detel, but this is seldom necessary. Clear Detel can be used alone in cases where there is an objection to a coloured coating. The field of utility opened up by the foregoing may seem comprehensive, but even to-day the proprietors inform us that new problems and new uses are of almost daily occurrence, and embrace interests and trades, widely separated, such as its use as a protective coating to metal cowls for exhausting nitric acid fumes and its use by makers of small metal containers as a cement instead of solder.

In the factory, whether due to moisture, steam, acid or other fumes, destruction is ever present, but can be prevented. The mention of factories brings forward the question of dust prevention, so important a factory where food is manufactured, or where cinematograph films or similar delicate materials are produced. Detel is not absorbed by a porous surface, it remains on top of whatever surface to which it it applied, it is therefore not lost in concrete, cement, plaster, wood, asbestos cement, etc., and being immune from attack by alkalies is unaffected by the lime in surfaces such as concrete and similar materials. In practice it has been found a great success and reasonably withstands the wear and tear of operatives going to and fro. A floor so coated is impervious to water, and can be washed with soap and water, or caustic potash if desired, without anything but a cleansing effect.

In the laboratory Detel is supplying the complete coatings for walls, floors, ceilings, benches and apparatus, and, not

least of all, the protection to the piping used to carry away fumes as well as those for ventilating purposes.

As its name implies, Detel Aluminium is Detel pigmented with aluminium. To-day, aluminium paints have a great vogue and are to be seen on much municipal property. Aluminium, as a metal, is readily attacked by moisture, sea atmosphere and fume-laden atmosphere, it is here that Detel, with its immunity from attack by these agents, again offers a coating of equal brilliance and of incomparable life.

Detel coatings can be applied to almost all surfaces, metal, stone, brick, wood, asbestos, asbestos cement, concrete, fabrics, leather and artificial leather goods. With regard to leather, Detel is so flexible and tough that it may prove to have a very big future in this line.

The white undercoating stands alone in that it is for particular use on damp or wet surfaces where drying out through the surface to be coated is desirable or necessary. All Detel coatings (paints) can be applied to wet or damp surfaces, but with the exception of Detel white undercoating they seal the moisture and prevent its evaporating through the Detel coating. Detel white undercoating will allow the wet surface to dry out through it without causing any harm to the surface. Detel metal undercoatings (pure metallic zinc and lead) leave a surface of about 90-92 per cent. pure metal, zinc or lead, as the case may be. This coating, in the case of the zinc, is in actual electrical contact and affords a true anodic protection to the metal surface to which it is applied, and is, in effect, equivalent to cold galvanising. As a matter of no little interest it may be mentioned that the manufacturers were of the opinion that this zinc undercoating would appeal perhaps more strongly to the imagination of the metal industries, where galvanising or one of the processes designed to achieve the same result, is carried out, but they have so far not realised their expectations. The reason for this may be that the advantage to be derived from the use of this coating takes time (months) to prove, whereas the simple and ready-to-hand ability to demonstrate the resistant properties of their other products is but the matter of moments and leaves no room for doubt or scepticism.

Detel coatings (paints) dry by evaporation, not oxidation. When dry, the coating is non-inflammable; therefore it does not add to the risk of fire, but being non-inflammable it contributes to the non-inflammability of the surface to which it is applied.

Tile Linings for Acid Towers

Minimum Number of Joints

SPECIAL acid-resisting lining tiles for Gaillard towers used in the manufacture of sulphuric acid are supplied by B. Whitaker and Sons, Ltd. These tiles are used with a special joint to assist the prevention of acid and gas leakage They are made to various sizes according to the size of the tower, but are kept within reasonable limits to facilitate erection. Mud-boxes, gas outlets, atomising holes are all formed of special blocks to ensure rigidity and to eliminate joints wherever possible. By the use of special blocks the joints are kept to the minimum, thereby ensuring the utmost efficiency and longest life with the advantage of simple erection.

A large volume of business is also being done in packings for Glover towers. These packings take many forms from the Huncoat " Duro " packings, to rings, balls, spiral blocks, etc. In great demand are rings to various sizes and to customers' requirements; these are usually hollow, having a similar appearance to a field drain, only cut in lengths of usually 4½ inches. There are also concentric rings which are not hollow except for a network of holes running through the ring. The necessary material for supporting the packings is also made and takes the form of arches, which carry the bearer blocks, which in turn carry the base bricks for the packings. These materials are made to suit any size of tower, whether square or round, and are made in such a manner to impart the greatest efficiency to the acid-resisting earthenware. Owing to the various forms and sizes which Glover and Gay Lussac towers take, B. Whitaker and Sons gladly submit designs to inquirers to show suggested forms of construction.

Many linings are made for tanks which are to be used for various purposes, such as mother liquor tanks, fatty acid bleachers, acid oil settling tanks, hydrochloric pickling tanks, concentration plants, saturators, gas washers and nitric acid plants. In all these cases the suppliers of the linings work to customers' requirements and submit suggestions which will most aptly suit the job. Other materials are useful for situations where they have to resist wear through abrasion. For instance, in the disposal of ash and clinker from large boiler plants, material can be so made to form a sluice, thereby taking the place of steel and iron which soon lends itself to corrosion. Floor tiles are supplied for bleaching chambers, where resistance to abrasion is also demanded in addition to corrosion. Engineering bricks, which are manufactured from the same material as acid-resisting ware, are suitable for chimneys, sewers and other work where corrosion is to be resisted. These bricks are made to all sizes and shapes to suit the class of work for which they are required. Such bricks are recommended for road paving and for floors.

Personal Notes

MR. FREDERICK J. WOLFE, chairman of the Anglo-American Oil Co., Ltd., has been appointed to the board of the British Mexican Petroleum Co., Ltd.

MR. B. T. PRIESTMAN, who has been works chemist to Reckitt and Sons, Ltd., for many years, has been appointed to a seat on the board of the company.

SIR ALFRED PALMER, late of Walworth Castle, Darlington, died in his 83rd year, at Wimbledon, on August 9. Sir Alfred was a former chairman of the Tyne Improvement Commission and a director of the Bede Metal and Chemical Co., Ltd.

MR. CYRUS BRABY has been appointed chairman and MR. IVON BRABY has been made deputy-chairman of Frederick Braby and Co., Ltd., following the recent death of Mr. Walter Braby. MR. ROBERT M. NICOL, who joined the firm in Glasgow, and was manager of the Bristol branch, has been asked to join the board.

MR. ALFRED WALTER BUSH, joint managing director of W. J. Bush and Co., died at Middlesex Hospital on August 3 at the age of 69. A service at All Saints' Church, Highgate, on August 7 was conducted by the Rev. G. E. Quinion, and cremation subsequently took place at Golder's Green Crematorium.

Recent wills include PROFESSOR JULIUS BEREND COHEN, of Thwaite Cottage, Coniston, Lancashire, and formerly of North Grange Mount, Headingley, Leeds, Emeritus Professor of Organic Chemistry in the University of Leeds, left £13,902 (net personalty £12,262); MR. HENRY JAMES GEORGE HOLLINGSHURST, of 1 Wentbury Road, Ealing, London, W., retired merchant in chemicals, who died on July 11, aged 70 years, left estate of the gross value of £283,791, with net personalty £280,683; SIR WILLIAM CUNDIFF, of Greystones, Lytham Road, Blackpool, late managing director of Baker and Co., Ltd., chemical manufacturers, a former Lord Mayor of Manchester, and an alderman of the city council, left estate of the gross value of £202,031 (net personalty £178,410); SIR JAMES WALKER, Professor Emeritus of Chemistry, Edinburgh University, left estate valued at £34,070.

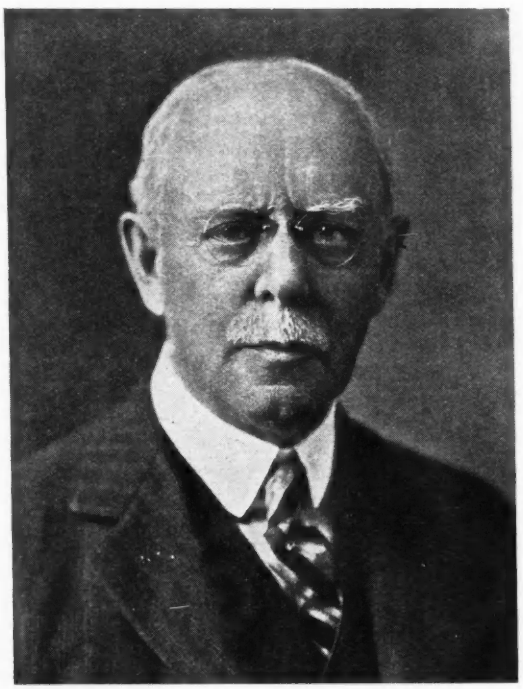
DR. EVERETT P. PARTRIDGE has been appointed director of research, Hall Laboratories, Inc. In this position he will be associated with technical specialists of Hagan Corporation, the Buromin Co., and Calgon, Inc., all of which are allied organisations, and also with the incumbents of the Industrial Fellowship on Calgonising sustained by Calgon, Inc., at Mellon Institute of Industrial Research. Dr. Partridge has distinguished himself during the past ten years by his researches on boiler-water problems. On completing his undergraduate course in chemical engineering at Syracuse University in 1925 he transferred to the University of Michigan, where—as Detroit Edison Fellow in chemical engineering under the direction of Professor Alfred H. White—he investigated the acid-treatment of zeolite-softened bicarbonate waters and the fundamental mechanism of boiler-scale formation. At the conclusion of his graduate studies he was appointed associate editor of "Industrial and Engineering Chemistry." While specialising in the study and reporting of industrial operations for this periodical, he also served on a part-time basis as research engineer of the Department of Engineering Research of the University of Michigan in connection with further studies of scale prevention, and prepared a monograph on the "Formation and Properties of Boiler Scale."

Death of Dr. Arthur D. Little

His Work in the Development of Laboratory Discoveries

DR. ARTHUR D. LITTLE, president of the Society of Chemical Industry for the year 1928-29, died on August 1.

Dr. Little, who had an unusually wide experience in the industrial development of laboratory discoveries, was born in Boston, Massachusetts, on December 15, 1863. He was educated at the public schools of Portland (Maine), the Berkeley School (New York), and the Massachusetts Institute of Technology. After leaving the Massachusetts Institute of Technology he became chemist, and, later, superintendent, of the first sulphite wood pulp mill in the United States, owned by the Richmond Paper Co. A year or two later he became junior partner in the firm of Griffin and Little, consulting chemists, and from then he carried on the practice of a consulting chemist. For over twenty years he was president of Arthur D. Little, Inc., which has laboratories for industrial research at Cambridge, Massachusetts.



The late Dr. Arthur D. Little

Dr. Little was the inventor of processes for the manufacture of chrome-tanned leather, artificial silk, the electrolytic manufacture of chlorates, and the production of alcohols and special products from petroleum. During recent years he gave much study to the processing of fuels, low-temperature carbonisation, and vapour-phase cracking, together with the utilisation of waste gases for the production of alcohols and the enrichment of blue water-gas. Another marked achievement was his development of the smoke filter for the protection of troops from poison smokes during the Great War.

He was president of the Society of Chemical Industry for the year 1928-29, and was presented with the Perkin Medal in January, 1931, when he delivered an address giving a survey of the chemical industry in America. In 1918 he was awarded the degree of Doctor of Chemistry by Pittsburg University, and in 1929 he received the honorary degree of Doctor of Science from Manchester University. He served for two years, 1912-1914, as president of the American Chemical Society, and was president of the American Institute of Chemical Engineers in 1919. One of his important tasks was that of organising the National Resources Survey for the Canadian Pacific Railway, 1916-17. He also founded the School of Chemical Engineering Practice at the Massachusetts Institute of Technology.

The Incorporation of Rubber with Tar Products

Investigations at the Chemical Research Laboratory

THE June issue of the "Bulletin of the Rubber Growers' Association" contains the report of an investigation on the incorporation of rubber with tar products, as carried out by David D. Pratt and Roy Handley, under the supervision of Professor G. T. Morgan, at the Chemical Research Laboratory, Teddington. This investigation was part of the scheme of research organised by the Technical Research and Development of New Uses Committee of the Rubber Growers' Association.

The production of tar in Great Britain is said to amount approximately to 2,000,000 tons or 450,000,000 gal. annually, and of this quantity more than 50 per cent. finds application in road construction and road surfacing. It is, therefore, of the utmost importance that all possible methods of improving this British-made material should be explored, and experiments on the incorporation of rubber with tars were undertaken primarily for this object, but in the course of these investigations the results suggested other applications of intermediate products.

Coke-oven and horizontal retort tars are very similar in composition and consist essentially of from 50 to 60 per cent. of highly polymerised, resinous material dissolved in oils of aromatic nature and containing small percentages of phenols, such as carbolic acid and the cresols, and bases such as pyridine. The neutral oils consist of the well-known aromatic hydrocarbons, benzene, toluene, naphthalene and anthracene, together with their homologues. At the other end of the scale low temperature tars, which are low aromatic tars, contain only about 20 per cent. of resinous material dissolved in oils of a paraffinoid and hydrogenated nature containing a large percentage, often amounting to 25 per cent. of the tar, of phenolic compounds. Aromatic constituents such as naphthalene and anthracene which are characteristic of high temperature tars occur only in traces.

Produced at temperatures intermediate between high temperature and low temperature carbonisation vertical retort tars display characteristics of both horizontal and low temperature tars. Thus, the resinoid content which is less polymerised than in the high temperature tar is about 50 per cent., but the phenolic portion approximates to that of a low temperature tar, whilst the neutral oils contain both aromatic and paraffinoid constituents.

Two general methods are in operation for the preparation of refined tars for road work: (1) Distillation or "topping" of the crude tar to a predetermined temperature to remove volatile oils, phenols and naphthalene, leaving a residual tar of the required viscosity. (2) Distillation of crude tar to 360° leaving a residue of pitch which is subsequently "oiled back" with a prepared neutral oil to furnish a tar of the required viscosity. Method 1 is employed chiefly in the case of coke-oven and horizontal retort tars, since they contain only a small percentage of phenols which are almost wholly removed by "topping." As phenolic content is rigidly restricted in road tar specifications, vertical retort tars are refined by Method 2, the prepared oil being washed with aqueous caustic soda to reduce substantially the percentage of phenols. Up to the present time low temperature tars, as such, have not been applied to the roads, but if and

when this use is made of them they will be probably prepared by Method 2.

When high temperature tars are distilled, a fraction rich in naphthalene occurs between 200° and 230° C. From 230° to 300° a distillate known as dead oil is collected, and from 300° to 360° the well-known anthracene fraction (green grease) distils over. This oil yields a crystalline deposit which is filtered and drained and is known as anthracene cake, the oily filtrate being marketed as anthracene oil. Anthracene oil is, therefore, a saturated solution of anthracene and related crystalline hydrocarbons in other constituents of an oily nature. At 360° the distillation is complete and the residue in the still, amounting to over 50 per cent. of the crude tar, is run out hot and forms tar pitch which, therefore, consists of the undistillable resinoids of the tar after treatment at 360° C.

Homogeniser as Alternative to Milling

Corresponding distillates from vertical retort and low temperature tars do not show the same characteristics as the aforementioned fractions from high temperature tars. There is no deposition of solid aromatic hydrocarbons from low temperature tars, although in the least volatile fraction waxy constituents separate out. To prepare neutral oils from these tars selected fractions are washed successively with aqueous caustic soda and mineral acid to remove phenolic acid basic constituents respectively.

A fraction of oil distilling between 300° and 360° was prepared from each type of tar, filtered if necessary from crystalline deposit and dephenolated by washing with aqueous caustic soda. When these oils were milled with crepe rubber the 20/80 oil-rubber incorporations formed were readily diluted to any desired concentration by heating at 100° with fresh additions of oil. It was observed in these experiments that of the three oils the low temperature tar product most readily incorporated with rubber.

Since milling operations are slow and costly, an alternative method of introducing rubber into tar oils was developed by the use of the Hurrell homogeniser. Tar oils passed through this apparatus together with unvulcanised 40 or 60 per cent. latex gave rise to opaque viscous emulsions which, on heating to 120° C. for 20 hours, were converted into clear homogeneous solutions comparable with those obtained by milling and dilution. Prolonged heating at 120° may be dispensed with by further application of the homogeniser, for if the first-formed emulsions are passed from 8 to 10 times through this apparatus at 100° during a period not exceeding 10 to 15 minutes, the product becomes increasingly clarified with a corresponding decrease in viscosity, and the final product is comparable with those obtained either by milling experiments or by 20 hours' heating of the emulsion in open vessels.

The amount of rubber which can be introduced in one run through the homogeniser varies with the type of oil. Low temperature tar oil can absorb 7 to 8 per cent. of its weight of rubber, whereas 5 per cent .is the maximum for anthracene oil. The final clear limpid solutions, however, can be utilised as fresh starting material, and solutions containing up to 20 per cent. of rubber can thus be concentrated.

Production of Stable Solutions

Many incorporations of tar oils and rubber have been carried out on various fractions of both low temperature and vertical retort tar oils, and in all cases clear, stable solutions were obtained. Commercial anthracene oil from high temperature tar is also a suitable medium, but care must be exercised in the selection of this oil, as on one occasion a very heavy oil distilling between 330° and 360° failed to give a satisfactory emulsion. This problem is examined in more detail in the next section. Parallel experiments on the introduction of vulcanised rubber into tar oils were carried out employing a vulcanised latex (Vultex). Emulsions were readily formed with all three types of oil and on heating or, preferably, on repeated passage through the homogeniser, they were clarified to clear, stable gels which, on filtration, were separated into the original oil as filtrate and a concentrated gel or paste

No fraction of horizontal retort tar has been found to yield complexes of oil, rubber and pitch so satisfactorily as oils from low temperature or vertical retort tars, but a considerable degree of stability is attainable by selection of suitable fractions. For example, dead oil, the fraction distilling between 230° and 300°, which is not so highly saturated as anthracene oil, readily dissolved rubber and yielded stable complexes containing up to 30 per cent. of pitch. Moreover, on employing an oil distilling between 160° and 175° C. stable complexes containing up to 50 per cent. of pitch were obtained.

It is evident that by the selection of oils substantially free from crystalline material, stable oil-rubber-pitch complexes can be constituted from high temperature tar products, but since in practice road tars derived from horizontal tar contain a large proportion of anthracene oil a stabilising diluent must be added.

The experiments described on the incorporation of rubber into tar oils with or without the addition of pitch suggest a readily available method whereby pitch-rubber complexes may be produced. Since the possibility of direct introduction of rubber into pitch by the use of the homogeniser is limited by the fact that even a small addition of rubber renders the pitch so tough that difficulties arise in the manipulation of the apparatus, use has been made of volatile oils as a "carrying medium." A series of pitch-rubber complexes has been prepared containing from 10 up to 90 per cent. of rubber by the following general method. Unvulcanised 60 per cent. latex was homogenised with neutral low temperature tar oil b.p. 100-180° C. and a clear solution containing 16.0 per cent. rubber formed. To weighed portions of this solution pitch was added up to the desired concentration, dissolving by warming at 80° and the mixture again homogenised. The volatile oils were then removed either by vacuum or steam distillation leaving the rubber-pitch component. As might be expected, such components exhibit increasing toughness with increase of rubber content and are promising starting materials for further experiment.

The chief conclusions drawn from this investigation are: (1) Vulcanised or unvulcanised rubber is readily introduced into low temperature or vertical retort tars previously dephenolated either by (*a*) dissolving the rubber in selected oils and adding the desired proportion of pitch, or by (*b*) homogenising the prepared tar direct with latex, with subsequent removal of water. (2) Vulcanised rubber is compatible with horizontal retort tar, but to prepare a complex consisting of this tar and unvulcanised rubber, a diluent must be added; low temperature tar oil is a suitable medium as are to a lesser degree horizontal retort tar oils previously freed from crystalline material. (3) Rubber can be incorporated into any pitch by the use of a volatile tar oil (preferably low temperature tar oil) which dissolves both rubber and pitch and can be removed by steam distillation.

Transparent Rubber

Counteracting the Ill-Effect of Exposure to Light

AN interesting article on transparent rubber appears in the "Vanderbilt News" for May and June. The main difficulty in the past has been maintenance of transparency after exposure to light. Darkening is caused by sulphur or other ingredients crystallising out. The proportion of sulphur should be kept as low as possible, so that it may be completely absorbed in the cure, leaving practically none free. If zinc oxide is used it must be preferably of fine particle size, and, if accelerators are added, up to 0.75 per cent. of zinc oxide may be used. If more than this proportion is used milkiness will result. Butyl zincate is recommended as a good accelerator, and the cure extended beyond optimum to secure maximum clearness and freedom from crystallisation.

German Production of Synthetic Resins

DESPITE a marked increase in German production of synthetic resins in recent times, it is believed that the German synthetic resins industry is only at the threshold of its real development and that with continued steady improvement in production, multiplication of types, steady widening scope of uses for plastic materials—and more particularly their merits as substitutes for imported products—output will expand markedly in the future. Seven plants furnish the national output of resins, and of their total output of over 16,000 metric tons in 1934, around 15,000 tons was of phenol and cresol base, about 1,000 tons urea, an additional 225 tons comprising material of acetylcellulose base.

The Chemical Age Lawn Tennis Tournament

Arrangements for the Finals

WE have pleasure in announcing that the finals of the fifth annual CHEMICAL AGE Lawn Tennis Tournament will be played at the sports ground of Johnson, Matthey and Co., Ltd., at the Toll Gate, College Road, Dulwich, on September 14. This is the second occasion on which Johnson, Matthey and Co., Ltd., have kindly placed their grounds at the disposal of the tournament, and those who remember the pleasant afternoon spent at Dulwich in 1933 will again look forward to an interesting gathering amidst charming surroundings. The matches this year will be played on hard courts, and at the close of play the guests will be entertained to tea.

THE CHEMICAL AGE silver challenge cups will be presented to the winners of the singles and doubles respectively, and miniature trophies given by Thomas Hill-Jones, Ltd., and Mr. W. Lloyd Willey, of the same firm, will go to the winners and runners up in each section of the tournament. Mr. Glanvill Benn, a member of the board of Benn Brothers, Ltd., and son of Sir Ernest Benn, the chairman, will present the awards.

Results of the third round matches, together with particulars of the semi-final draw, are given below. Last year's winner of the singles has already been defeated, but the draw for the semi-finals is of special interest in view of the fact that the holders of the doubles cup, F. G. Hawley and J. Haines, of the Anglo-Iranian Oil Co., Ltd., who are competing in the singles for the first time this year, are drawn to meet each other in one of the matches. In the doubles there is a possibility of a final between the same pairs as last year. Hawley and Haines are in one of the semi-finals, and V. J. Prosser and A. Baxter, of John Haig and Co., Ltd., are in the other.

Third Round Results

SINGLES.

F. G. Hawley (Anglo-Iranian Oil Co.) defeated D. G. Blow (The British Drug Houses, Ltd.), 6-1, 6-1.

L. F. Grape (Borax Consolidated, Ltd.) defeated A. E. Munns (Paper Goods Manufacturing Co.), 6-4, 6-1.

R. N. B. D. Bruce (Gas Light and Coke Co.) defeated A. C. Collins (Sparklets, Ltd.), 6-3, 6-3.

J. Haines (Anglo-Iranian Oil Co., Ltd.) defeated A. Tickner (British Celanese, Ltd.), 6-2, 6-3.

DOUBLES.

J. Haines and F. G. Hawley (Anglo-Iranian Oil Co., Ltd.) walk-over, R. N. B. D. Bruce and E. H. M. Badger (Gas Light and Coke Co.), scratched.

A. E. Willshere and L. F. Grape (Borax Consolidated, Ltd.) defeated C. G. Copp and R. D. Hayman (Doulton and Co., Ltd.), 6-2, 7-5.

V. J. Prosser and A. Baxter (John Haig and Co., Ltd.) walk-over, E. G. Almond and G. Barnett (Bakelite, Ltd.), scratched.

F. R. O. Allen and R. A. J. Bennett (Nobel Chemical Finishes, Ltd.) defeated S. Harbour and A. J. Webb (Williams (Hounslow), Ltd.), 6-2, 6-2.

Semi-Final Draw

The draw for the semi-finals is as follows. All four matches must be played not later than September 3 and the results forwarded to the Editor of THE CHEMICAL AGE not later than first post on September 4.

Singles

Haines, J. Anglo-Iranian Oil Co., Ltd., Britannic House, Finsbury Circus, London. (National 1212.)	*v*	**Hawley, F. G.** Anglo-Iranian Oil Co., Britannic House, Finsbury Circus, London. (National 1212.)
Grape, L. F. Borax Consolidated Ltd., Regis House, King William Street, London, E.C.4. (Mansion House 8332.)	*v*	**Bruce, R. N. B. D** Gas Light and Coke Co., No. 1 Laboratory, Fulham, London, S.W.6. (Fulham 3531, Ext. 10.)

Doubles

Willshere, A. E., & Grape, L. F. Borax Consolidated, Ltd., Regis House, King William Street, London, E.C.4. (Mansion House 8332.)	*v*	**Prosser, V. J., & Baxter, A.** John Haig & Co., Ltd., 2, Pall Mall East, London, S.W.1. (Whitehall 1040.)
Haines, J., & Hawley, F. G. Anglo-Iranian Oil Co., Ltd., Britannic House, Finsbury Circus, London. (National 1212.)	*v*	**Allen, F. R. O., & Bennett, R. A. J.** Nobel Chemical Finishes, Ltd., Wexham Road, Slough, Bucks. (Slough 528, Ext. 210.)

The Soap Industry in Russia

An Extensive Programme of Research Adopted

THE national importance of a large and flourishing soap industry, and indeed of all industries associated with oils and fats, has long been realised by those responsible for technical planning in Russia. Soap manufacture, of course, derives added interest from its by-product, glycerine.

Among the principal difficulties confronting the Russian soap industry is an adequate supply of raw material, especially oils and fats, for although she has large areas under oilseeds Russia has barely enough for the edible trades and none too much to spare for the soap-making and other industries, including fat hardening which is now largely operated on behalf of the edible interests. It has accordingly been decided to seek other sources of supply in at least two principal directions, namely, (a) in substituting colloidal clay for oils and fats as much as possible, possibly by utilising the large reputed deposits of kaolin which have been found near Moscow, and (b) synthesising fatty acids from mineral oils, chiefly paraffin and low-grade distillates, of which there are plentiful supplies available.

As to the first of these proposals, the use of clay in soap-making and also as a cleansing agent on its own has long been known. The classic researches of Weston, fifteen years or more ago, and of other workers since, have shown that particular types of clay, such as colloidal kaolin, have valuable detergent properties and markedly increases the cleansing efficiency of soaps in which it is incorporated. In other important directions the Russian soap industry is striking out in new fields, as, for example, in devising new methods of measuring detergent power, in developing a rapid and continuous process of saponification, and in other ways. Both the laundry and soap interests have established well-equipped research laboratories, and some of the most distinguished of Russian chemists are now engaged on ambitious programmes of research along those lines above indicated.

In regard to rapid and continuous saponification, one method recently described consists in spraying a correctly proportioned mixture of fatty acids and naphthenic acids (assitol) with or without rosin into the reaction pan, fitted with heating and stirring mechanism, and then also to spray in a solution of caustic soda of the right strength, and finally to add the fillers, such as colloidal clay, trisodium phosphate, or other material. It is claimed that this method is not only continuous but is entirely mechanised, and only lasts a few minutes. It would seem, however, that since the spraying and other operations are not new the chief novelty will consist in the particular type of plant used. Of this, full details with diagrams are given in "Maslob. Schirow. Djelo," 1935, 11, 63.

Other recent work deals with methods for measuring detergent power, based on the use of Busag's displacement angle and a study by this means of the mutual action between soiled surface (the substrate) and dirt, with the effect of soap solutions of varying strength on this action. The subject at present would appear to be mainly of academic interest, but a useful and reliable method may ultimately be evolved. Suspensions of quartz or graphite in distilled water were prepared of varying particle size, most of the water siphoned off, and soap solution carefully added. The tubes were then

closed and allowed to stand for about twelve hours, after which they were placed on a perfectly horizontal slab which was so hinged that it could be slowly and very accurately sloped to any desired angle. The angle at which the particles, observed through a microscope, first begin to move is the displacement angle, and is regarded as the decisive factor in these tests. The work at present has been limited to dirt of a pulverulent kind, consisting for the most part of floor dust, soot or carbon, and miscellaneous "wear and tear" particles. It is being continued and it is hoped that a valuable contribution will ultimately be made to the large amount of work already done during the past few years in measuring the detergent power of soaps. Research in this field is also being carried out in Italy and in the United States.

Continental Chemical Notes

Germany

NEW METHODS FOR THE DETECTION OF GLYCERINE, allyl alcohol, glyoxylic acid and oxalic acid are described by Eegrive in "Z. analyt. Chemie," 1935 (pp. 31-36). A highly sensitive fluorescence reaction for glycerine involves oxidation to dihydroxyacetone, conversion of the latter to the aldehyde with concentrated sulphuric acid and reaction with solid meta-hydroxy benzoic acid. The ensuing green fluorescence permits detection of as little as 0.005 mg. glycerine in a drop of solution. The same reaction is applicable to allyl alcohol, oxidation of which likewise yields dihydroxyacetone. Pyrogallic acid is proposed as a reagent for glyoxylic acid, the resulting characteristic blue coloration developing in the presence of as little as 0.001 mg. of glyoxylic acid. Detection of oxalic acid is based upon initial reduction to glyoxylic acid with the aid of magnesium powder.

Russia

WORK HAS STARTED ON THE EXPLOITATION of borate deposits round the Inderski lakes in Western Caucasia. An output of 8,000 tons is anticipated in the coming year.

A NEW FLUORESCENCE INDICATOR, beta-methylumbelliferone, is reported by Poukierev and Maslova (abstracted in "Chimie et Industrie," July, 1935). Its use depends upon development of a blue fluorescence in alkaline solution while it remains colourless in acid solution. For titration, an 0.3 per cent. solution in alcohol is recommended.

WASTE MATERIAL FROM ALUMINIUM CHLORIDE MANUFACTURE starting from kaolin is an excellent porous support for platinum, as used in the sulphuric acid contact process, report Adadourov and co-workers in "J. Prikl. Khim." (abstracted in "Chimie et Industrie," July, 1935). Thin coatings of platinum are formed on the surface by applying a solution of platinum chloride in oil of turpentine (preferably treated with sulphur monochloride) and igniting the mass. Starting from a gas containing 6 to 7.5 per cent. sulphur dioxide, such a catalyst gives an oxidation yield of 96 to 97 per cent. at a temperature of 350 to 475° C. It is resistant to water vapour under normal industrial conditions and is easily regenerated by air-blowing at 600° C. Like other platinum catalysts supported on silica gel, however, it is readily poisoned by arsenic.

Italy

MINERAL OIL PRODUCTION FROM ASPHALT which has been practised in Ragusa (Sicily) for over 12 years has now reached an annual output of 10,000 tons (reports "Die Chemische Industrie"). Resembling Californian and Texas crude oil, the material is a good lubricant. Plant extensions are now in progress with a view to securing an annual output of about 50,000 tons.

DETAILS OF THE PREPARATION of the three citric acid anilides are published by di Mento in "Ann. Chim. Appliceta" (Vol. 24, No. 9, p. 464). To prepare the monoanilide, 50 g. freshly distilled aniline are warmed with 30 g. citric acid crystals at 60 to 70° C. when a yellow liquid forms. The temperature is raised to 120 to 130° C. and held for two to three hours. The brown syrupy mass is cooled and boiled for 30 minutes with 200 c.c. water prior to cooling down to 80° C. and filtering. The residue is washed until neutral and the entire filtrate concentrated to crystallise the monoanilide (m.p. 164° C.). The residue, comprising citric acid di- and trianilides is boiled in 200 c.c. water for an hour, filtered, and the residue washed with water. On standing, the yellow filtrate deposits crystals of the dianilide (m.p. 179° C.). The residue is washed with alkali prior to recrystallisation from dilute alcohol to give the trianilide (m.p. 199° C.).

Far Eastern Chemical Notes

Japan

ENLARGEMENT OF ITS FIELD OF ACTIVITY has prompted the Tokio Sulphur Works Co. (Tokio Ryusan Seizo K.K.) to change its style to Tokio Sulphur Chemical Industry Co. (Tokio Kagaku Kogyo K.K.). Among the dyestuff intermediates which it now manufactures is H-acid (20 tons monthly), while plants now under construction include those for chlorsulphonic acid, beta-naphthylamine and sulphuryl chloride.

China

THE FIRST LIQUID SOAP MANUFACTURING PLANT in China was recently started up by a firm in Shanghai.

THE MANUFACTURE OF CHINESE MEDICINAL CHEMICALS will be undertaken by a new company, with a capital of 200,000 Chinese dollars, formed under the auspices of the National Medical Institute.

SULPHURIC ACID WORKS with a daily output capacity of 15 tons 98 per cent. acid has just been constructed near Canton. Although the present total consumption in the entire province of Kwangtung is less than the new factory's potential output, a considerable jump in consumption is awaited on completion of the ammonium sulphate works now under construction. An alkali electrolysis plant has also been built in the vicinity of the new acid works.

New Solvent Factory for Britain

Molasses as Raw Material

GREAT Britain is shortly to possess the most modern factory in the world for the manufacture of commercial chemical solvents which are of vital importance to a wide range of industrial manufacturing processes. A large factory for this purpose is being equipped at Bromborough Port, Cheshire, and when production is commenced in October next permanent employment will be provided for hundreds of men. Orders for plant and machinery of the latest type to a total value of £250,000 have already been placed in Great Britain.

The new enterprise, which represents one of the most important industrial developments in recent years, is being carried out by a British private company formed under the auspices of the Commercial Solvents Corporation in conjunction with the Barter Trading Corporation. Commercial solvents have become one of the most essential factors to modern high-speed production in a wide variety of important industries and their use is extending rapidly. The raw material is sugar molasses from which are produced acetone and alcohol. This group of chemical solvents is employed in many manufacturing processes, including the production of lacquer for motor cars, artificial silk, dyes, leather, rubber, perfumes, pharmaceutical products, soaps, paints, wax, petrol and other commodities. New uses for solvents are being devised almost daily, and the new factory at Bromborough will have a fully-equipped research department for the development of processes.

The new works at Bromborough will consume annually many thousands of tons of molasses and the whole output of the 18 beet sugar factories in Great Britain could be absorbed several times over.

THE Polish dye industry showed appreciable progress in 1934, with a 50 per cent. increase in production, the output totalling 1,800 metric tons as compared with 1,200 tons in 1933. This increase was in part the result of greater demand and was also due to the production of new products, including Chrysochenine G, Rhodamine B and Naphthalene Green V.

Chemical and Allied Stocks and Shares

Current Quotations

THE following table shows this week's Stock Exchange quotations of chemical and allied stocks and shares compared with those of last week. Except where otherwise shown the shares are of £1 denomination.

Name.	August 13.	August 6.
Anglo-Iranian Oil Co., Ltd. Ord.	68/1½	65/-
,, 8% Cum. Pref.	36/9	36/6
,, 9% Cum. Pref.	38/3	37/9
Associated Dyers and Cleaners, Ltd. Ord.	1/10½	1/10½
,, 6½% Cum. Pref.	5/-	5/-
Associated Portland Cement Manufacturers, Ltd. Ord.	59/-	58/6
,, 5½% Cum. Pref.	27/6	27/6
Benzol & By-Products, Ltd. 6% Cum. Part Pref.	2/6	2/6
Berger (Lewis) & Sons, Ltd. Ord.	66/3	63/1½
Bleachers' Association, Ltd. Ord.	5/6	5/9
,, 5½% Cum. Pref.	9/4½	9/4½
Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.)	21/3	21/3
Boots Pure Drug Co., Ltd. Ord. (5/-)	50/3	49/6
Borax Consolidated, Ltd. Pfd. Ord. (£)	95/-	95/-
,, Defd. Ord.	17/-	16/6
,, 5½% Cum. Pref. (£10)	£11/2/6	£11/2/6
,, 4½% Deb. (1st Mort.) Red. (£100)	£109	£109
,, 4½% 2nd Mort. Deb. Red. (£100)	£104	£104
Bradford Dyers' Association, Ltd. Ord.	9/4½	9/4½
,, 5% Cum. Pref.	11/10½	11/10½
,, 4% 1st Mort. Perp. Deb. (£100)	£86/10/-	£85/10/-
British Celanese, Ltd. 7% 1st Cum. Pref.	26/6	26/6
,, 7½% Part. 2nd Cum. Pref.	24/-	24/3
British Cotton & Wool Dyers' Association Ltd. Ord. (5/-)	5/-	5/-
,, 4% 1st Mort. Deb. Red. (£100)	£91	£91
British Cyanides Co., Ltd. Ord. (2/-)	3/3	3/3
British Drug Houses, Ltd. Ord.	20/-	20/-
,, 5% Cum. Pref.	22/6	22/6
British Glues and Chemicals, Ltd. Ord. (4/-)	6/-	6/-
,, 8% Pref. (Cum. and Part.)	29/4½	29/4½
British Oil and Cake Mills, Ltd. Cum. Pfd. Ord.	48/1½	48/1½
,, 5½% Cum. Pref.	26/3	26/3
,, 4¼% First Mort. Deb. Red. (£100)	£107	£107/10/-
British Oxygen Co., Ltd. Ord.	117/6	116/3
,, 6½% Cum. Pref.	31/10½	31/10½
British Portland Cement Manufacturers, Ltd. Ord.	95/-	90/-
,, 6% Cum. Pref.	30/6	31/-
Bryant & May, Ltd. Pref.	67/6	67/6
Burt, Boulton & Haywood, Ltd. Ord.	21/3	21/3
,, 7% Cum. Pref.	27/6	27/6
,, 6% 1st Mort. Deb. Red. (£100)	£105/10/-	£105/10/
Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5)	110/-	110/-
,, 4% 1st Mort. Deb. Red. (£100)	£96/10/-	£96/10/
Calico Printers' Association, Ltd. Ord.	10/7½	10/7½
,, 5% Pref. (Cum.)	16/10½	16/10½
Cellulose Acetate Silk Co., Ltd. Ord.	11/3	10/7½
,, Deferred (1/-)	2/4½	1/10½
Consett Iron Co., Ltd. Ord.	9/-	7/3
,, 8% Pref.	28/9	26/3
,, 6% First Deb. stock, Red. (£100)	£105/10/-	£105/10/-
Cooper, McDougall & Robertson, Ltd. Ord.	36/3	36/3
,, 7% Cum. Pref.	30/-	30/-
Courtaulds, Ltd. Ord.	59/4½	56/10½
,, 5% Cum.	26/3	26/3
Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre-Pref.	25/-	25/-
,, Cum. 6% Pref.	28/9	28/9
,, 6½% Cum. Pref.	30/-	30/-
,, 7½% "A" Cum. Pref.	31/10½	30/7½
Distillers Co., Ltd. Ord.	94/-	93/-
,, 6% Pref. Stock Cum.	31/-	30/6
Dorman Long & Co., Ltd. Ord.	21/-	19/-
,, Prefd. Ord.	28/9	23/9
,, 6½% Non-Cum. 1st Pref.	23/-	22/-
,, 8% Non-Cum. 2nd Pref.	21/-	20/-
,, 4% First Mort. Perp. Deb. (£100)	£102/10/-	£102/10/-
,, 5% 1st Mort. Red. Deb. (£100)	£105	£105

Name.	August 13.	August 6.
English Velvet & Cord Dyers' Association, Ltd. Ord.	4/4½	4/4½
,, 5% Cum. Pref.	7/6	7/6
,, 4% First Mort. Deb. Red. (£100)	£70	£70
Fison, Packard & Prentice, Ltd. Ord.	38/1½	38/1½
,, 7% Non-Cum. Pref.	31/3	31/3
,, 4½% Debs. (Reg.) Red. (£100)	£106	£106
Gas Light & Coke Co. Ord.	28/-	28/3
,, 3½% Maximum Stock (£100)	£89/10/-	£90/10/-
,, 4% Consolidated Pref. Stock (£100)	£108/10/-	£110/10/-
,, 3% Consolidated Deb. Stock, Irred. (£100)	£90/10/-	£90/10/-
,, 5% Deb. Stock, Red. (£100)	£116/10/-	£116/10/-
,, 4½% Red. Deb. Stock (1960-65) (£100)	£114/10/-	£113/10/-
Goodlass Wall & Lead Industries, Ltd. Ord. (10/-)	12/6	12/6
,, 7% Prefd. Ord. (10/-)	13/1½	13/1½
,, 7% Cum. Pref.	30/-	30/-
Gossage, William, & Sons, Ltd. 5% 1st Cum. Pref.	24/4½	24/4½
,, 6½% Cum. Pref.	30/-	30/-
Imperial Chemical Industries, Ltd. Ord.	35/9	35/-
,, Deferred (10/-)	8/9	8/9
,, 7% Cum. Pref.	33/6	33/3
Imperial Smelting Corporation, Ltd. Ord.	15/3	13/6
,, 6½% Pref. (Cum.)	24/1½	22/6
International Nickel Co. of Canada, Ltd. Cum.	$28¾	$28½
Johnson, Matthey & Co., Ltd. 5% Cum. Pref. (£5)	95/-	95/-
,, 4% Mort. Deb. Red. (£100)	£98/10/-	£98/10/-
Laporte, B., Ltd. Ord.	115/-	112/6
Lawes Chemical Manure Co., Ltd. Ord. (1/-)	8/1½	7/6
,, 7% Non-Cum. Part Pref. (10/-)	10/-	10/-
Lever Bros. Ltd. 7% Cum. Pref.	32/-	31/9
,, 8% Cum. "A" Pref.	32/6	32/3
,, 20% Cum. Prefd. Ord.	78/1½	77/6
,, 5% Cons. Deb. (£100)	£109	£109
,, 4% Cons. Deb. (£100)	£105	£105
Magadi Soda Co., Ltd. 12½% Pref. Ord. (5/-)	1/3	1/3
,, 6% 2nd Pref. (5/-)	6d.	6d.
,, 6% 1st Debs. (Reg.)	£58	£58
Major & Co., Ltd. Ord. (5/-)	7½d.	7½d.
,, 8% Part. Prefd. Ord. (10/-)	9d.	9d.
,, 7½% Cum. Pref.	1/6¾	1/6¾
Pinchin, Johnson & Co., Ltd. Ord. (10/-)	44/-	43/6
,, 1st Pref. 6½% Cum.	33/1½	33/1½
Potash Syndicate of Germany (Deutsches Kalisyndikat G.m.b.H.) 7% Gld. Ln. Sr. "A" and "B" Rd.	£68/10/-	£69
Reckitt & Sons, Ltd. Ord.	115/-	115/-
,, 4½% Cum. 1st Pref.	25/-	25/-
Salt Union, Ltd. Ord.	45/-	41/3
,, Pref.	46/3	46/3
,, 4½ Deb. (£100)	£109/10/-	£109/10/-
South Metropolitan Gas Co. Ord. (£100)	£129/10/-	£129
,, 6% Irred. Pref. (£100)	£149/10/-	£149/10/-
,, 4% Pref. (Irred.) (£100)	£108/10/-	£108/10/-
,, Perpetual 3% Deb. (£100)	£88/10/-	£88/10/-
,, 5% Red. Deb. 1950-60 (£100)	£114/10/-	£114/10/-
Staveley Coal & Iron Co., Ltd. Ord.	46/10½	45/-
Stevenson & Howell, Ltd., 6½% Cum. Pref.	26/3	26/3
Triplex Safety Glass Co., Ltd. Ord. (10/-)	78/9	73/1½
Unilever, Ltd. Ord.	30/7½	33/9
,, 7% Cum. Pref.	29/3	34/3
United Glass Bottle Manufacturers, Ltd. Ord.	42/6	42/6
,, 7½% Cum. Pref.	33/-	33/-
United Molasses Co., Ltd. Ord. (6/8)	21/3	20/7½
,, 6% Cum. Pref.	23/9	23/9
United Premier Oil & Cake Co., Ltd. Ord. (5/-)	7/3	7/-
,, 7% Cum. Pref.	23/9	23/9
,, 6% Deb. Red. (£100)	£101	£101

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THERE are no price changes to report in the London markets for general heavy chemicals, rubber chemicals, wood distillation products, tar products and intermediates. Prices remain very steady with an increasing volume of business.

MANCHESTER.—With, perhaps, the worst of the seasonal dullness left behind, there has been rather more business passing on the Manchester chemical market this week. Up to the present, no big weight of fresh forward buying has been met with, but new business, although still relatively small, has been on a somewhat better scale than in either of the two previous weeks. One or two sellers have reported a fair demand for a range of miscellaneous chemicals for delivery over short periods, though the quantities involved have mostly been moderate. Delivery suspensions in consequence of holiday stoppages at consuming works in Lancashire and West Yorkshire districts are still faily numerous, but the position in this respect is hardly so bad as it was last week and somewhat bigger aggregate quantities of heavy products have been called for. The market maintains a steady tone in most sections.

SCOTLAND.—The past week has continued quiet in the Scottish heavy chemical market, with practically little or no change in the prices and with few bulk inquiries.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech. 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—Commercial granulated, £25 10s. per ton; crystal, £26 10s.; powdered, £27 10s.; extra finely powdered, £29 10s. packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. SCOTLAND: Crystals £26 10s.; powder, £27 10s.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11¾d. per lb. MANCHESTER: 11¾d. SCOTLAND: 11¾d.

ACID, CRESYLIC.—97/100%, 1s. 5d. to 1s. 6d. per gal.; 99/100%, refined, 1s. 9d. to 1s. 10d. per gal.

ACID, FORMIC.—LONDON: £40 to £45 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works. full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £55 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. SCOTLAND: 1s. 0¼d. less 5%. MANCHESTER: 1s. 0¾d. per lb.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE, SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £34 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 3d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £16 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £22 to £23, ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—LONDON: £10 10s. per ton. SCOTLAND: £10 10s. to £10 15s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 to £9 5s.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—3s. 4d. to 3s. 8d per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£31 to £33 per ton, drums extra.

CARBON BLACK.—3¾d. to 4¼d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3½d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £3 16s. 6d. net.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £25 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34 10s.; brown, £33.

LEAD NITRATE.—£28 to £29 per ton.

LEAD, RED.—SCOTLAND: £24 to £26 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £36 10s.

LITHOPONE.—LONDON: 30%, £16 to £17 per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—6¾d. to 7¼d. per lb. to December 31.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £36 10s.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5%, d/d U.K. Ground, 5¼d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £37 10s.

POTASSIUM CHROMATE.—6¼d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NIRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. crystals, 10d. to 10½d. MANCHESTER: B. P., 11¾d..

POTASSIUM PRUSSIATE.—LONDON: Yellow, 8½d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8½d. ex store. MANCHESTER: Yellow, 8½d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. SCOTLAND: Large crystals, in casks, £36.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r in bags.

SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£21 10s. per ton. LONDON: £22. SCOTLAND: £20 15s.

Sodium Bicarbonate.—Refined spot, £10 10s. per ton d/d station in bags. Scotland: Refined recrystallised £10 15s. ex quay or station. Manchester: £10 10s.

Sodium Bichromate.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. Anhydrous, 5d. per lb. London: 4d. per lot less 5% for spot lots and 4d. per lb. with discounts for contract quantities. Manchester: 4d. per lb. basis. Scotland: 4d. delivered buyer's premises with concession for contracts.

Sodium Bisulphite Powder.—60/62%, £20 per ton d/d 1-cwt. iron drums for home trade.

Sodium Carbonate, Monohydrate.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, Scotland: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.

Sodium Chlorate.—£32 10s. per ton. Scotland: 3⅝d. per lb.

Sodium Chromate.—4d. per lb. d/d U.K.

Sodium Hyposulphite.—Scotland: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. Manchester: Commercial, £10 5s.; photographic, £14 10s.

Sodium Meta Silicate.—£14 per ton, d/d U.K. in cwt. bags.

Sodium Iodide.—B.P., 6s. per lb.

Sodium Nitrite.—London: Spot, £18 5s. to £20 5s. per ton d/d station in drums.

Sodium Perborate.—10%, 9¼d. per lb. d/d in 1-cwt. drums. London: 10d. per lb.

Sodium Phosphate.—£13 per ton.

Sodium Prussiate.—London: 5d. to 5½d. per lb. Scotland: 5d. to 5¾d. ex store. Manchester: 5d. to 5½d.

Sodium Silicate.—140° Tw. Spot £8 per ton. Scotland: £8 10s.

Sodium Sulphate (Glauber Salts).—£4 2s. 6d. per ton d/d Scotland: English material £3 15s.

Sodium Sulphate (Salt Cake).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. Scotland: Ground quality, £3 5s. per ton d/d. Manchester: £3 5s.

Sodium Sulphide.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. Scotland: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. Manchester: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.

Sodium Sulphite.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.

Sulphur.—£9 10s. to £9 15s. per ton. Scotland: £8 to £9.

Sulphate of Copper.—Manchester: £14 2s. 6d. per ton f.o.b.

Sulphur Chloride.—5d. to 7d. per lb., according to quality.

Sulphur Precip.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.

Vermilion.—Pale or deep, 4s. 5d. to 4s. 7d. per lb.

Zinc Chloride.—Scotland: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

Zinc Sulphate.—London: £12 per ton. Scotland: £10 10s.

Zinc Sulphide.—10d. to 11d per lb.

Wood Distillation Products

Acetate of Lime.—Brown, £8 to £9. Grey, £11. Liquor, brown, 30° Tw., 8d. per gal. Manchester: Brown, £9; grey, £12 10s.

Acetic Acid, Technical, 40%.—£17 to £18 per ton.

Charcoal.—£5 to £10 per ton.

Methyl Acetone.—46-50%, £43 to £47 per ton.

Wood Creosote.—Unrefined, 3d. to 1s. 6d. per gal.

Wood Naphtha, Miscible.—2s. 6d. to 3s. 6d. per gal.; solvent, 3s. 3d. to 4s. 3d. per gal.

Wood Tar.—£2 to £4 per ton.

Intermediates and Dyes

Acid, Benzoic, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.

Acid, Gamma.—Spot, 4s. per lb. 100% d/d buyer's works.

Acid, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.

Acid Naphthionic.—1s. 8d. per lb.

Acid, Neville and Winther.—Spot, 3s. per lb. 100%.

Acid, Sulphanilic.—Spot, 8d. per lb. 100% d/d buyer's works.

Aniline Oil.—Spot, 8d. per lb., drums extra, d/d buyer's works.

Aniline Salts.—Spot, 8d. per lb. d/d buyer's works, casks free.

Benzaldehyde.—Spot, 1s. 8d. per lb., packages extra.

Benzidine Base.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.

Benzidine HCl.—2s. 5d. per lb.

p-Cresol 34-5° C.—1s. 9d. per lb. in ton lots.

m-Cresol 98/100%.—1s. 11d. per lb. in ton lots.

Dichloraniline.—1s. 11½d. to 2s. 3d. per lb.

Dimethylaniline.—Spot, 1s. 6d. per lb., package extra.

Dinitrobenzene.—8d. per lb.

Dinitrotoluene.—48/50° C., 9d. per lb.; 66/68° C., 01½d.

Dinitrochlorbenzene, Solid.—£72 per ton.

Diphenylamine.—Spot, 2s. per lb., d/d buyer's works.

α-Naphthol.—Spot, 2s. 4d. per lb., d/d buyer's works.

β-Naphthol.—Spot, £78 15s. per ton in paper bags.

α-Naphthylamine.—Spot, 11½d. per lb., d/d buyer's works.

β-Naphthylamine.—Spot, 2s. 9d. per lb., d/d buyer's works.

o-Nitraniline.—3ss. 11d. per lb.

m-Nitraniline.—Spot, 2s. 7d. per lb., d/d buyer's works.

p-Nitraniline.—Spot, 1s. 8d. per lb., d/d buyer's works.

Nitrobenzene.—Spot, 4½d. to 5d. per lb.: 5-cwt. lots, drums extra.

Nitronaphthalene.—9d. per lb.; P.G., 1s. 0½d. per lb.

Sodium Naphthionate.—Spot, 1s. 9d. per lb.

o-Toluidine.—9½d. to 11d. per lb. *p*-Toluidine.—1s. 11d. per lb.

Coal Tar Products

Acid, Carbolic.—Crystals, 6¾d. to 7½d. per lb.; crude, 60's, 1s. 1½d. to 2s. 2½d. per gal. Manchester: Crystals, 7½d. per lb.; crude, 2s. per gal. Scotland: 60's, 2s. 6d. to 2s. 7d.

Acid, Cresylic.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 5d. to 1s. 6d.; according to specification. London: 98/100%, 1s. 4d.; dark, 95/97%, 1s. Scotland: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.

Benzol.—At works, crude, 9½d to 10d. per gal.; standard motor 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. London: Motor, 1s. 3½d. Scotland: Motor, 1s. 6½d.

Creosote.—B.S.I. Specification standard, 6d. per gal. f.o.r. Home, 3¾d. d/d. London: 4½d. f.o.r. North; 5d. London. Manchester: 5¼d. to 5¾d&. Scotland: Specification oils, 4d.; washed oil, 4½d. to 4¾d.; light, 4½d.; heavy, 4½d. to 4¼d.

Naphtha.—Solvent, 90/100%, 1s. 5d. to 1s. 6d. per gal.; 95/160%, 1s. 6d.; 99%, 11d. to 1s. 1d. London: Solvent, 1s. 3½d. to 1s. 4½d.; heavy, 11d. to 1s. 0½d. f.o.r. Scotland: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

Naphthalene.—Purified crystals, £10 per ton in bags. London: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. Scotland: 40s. to 50s.; whizzed, 70s. to 75s.

Pitch.—Medium soft, 33s. to 35s. per ton. London: 35s. per ton, f.o.b. East Coast port. Manchester: 32s. 6d. to 34s. f.o.b. East Coast.

Pyridine.—90/140, 5s. 6d. to 8s. per gal.; 90/180, 2s. 3d.

Toluol.—90%, 1s. 11d. to 2s. per gal.; pure, 2s. 2d.

Xylol.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

Nitrogen Fertilisers

Sulphate of Ammonia.—For delivery during August the price for neutral quality basis 20.6% nitrogen has been announced at £7 5s. per ton, less 10s. 6d. per ton for August delivery. This price of £5 14s. 6d. delivered to farmer's nearest station in 6-ton lots is the same price as for August, 1934. For delivery later than August no prices have yet been announced.

Calcium Cyanamide.—The price for August delivery has been announced at £6 15s. per ton delivered in 4-ton lots to farmer's nearest station.

Nitro-Chalk.—The price for the new season has been announced at £7 5s. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.

Nitrate of Soda.—The price for this product for the 1935/36 season has been announced at £7 12s. 6d. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.

Concentrated Complete and Nitrogen Phosphate Fertilisers.—Up to the present no prices have been announced for the year 1935/36 and the June prices remain in force for prompt delivery.

Latest Oil Prices

London, Aug. 14.—**Linseed Oil** was firm. Spot, £24 per ton (small quantities); Aug., £21 10s.; Sept.-Dec., £21 17s. 6d.; Jan.-April, £22, naked. **Soya Bean Oil** was quiet. Oriental (bulk), Aug.-Sept. shipment, £18 10s. per ton. **Rape Oil** was inactive. Crude extracted, £31 per ton; technical refined, £32 10s., naked, ex wharf. **Cotton Oil** was dull. Egyptian crude, £23 per ton; refined common edible, £27; and deodorised, £29, naked, ex mill (small lots £1 10s. extra). **Turpentine** was quiet. American, spot, 43s. 9d. per cwt.

Hull.—**Linseed Oil**, spot, quoted £22 12s. 6d. per ton; Aug., £22 2s. 6d.; Sept.-Dec. and Jan.-April, £22. **Cotton Oil.**—Egyptian, crude, spot, £23; edible, refined, spot, £26; technical, spot, £26; deodorised, £28, naked. **Palm Kernel Oil**, crude, f.m.q. spot, £18 10s. naked. **Groundnut Oil**, extracted, spot, £31; deodorised, £34. **Rape Oil**, extracted, spot, £30; refined, £31 10s. **Soya Oil**, extracted, spot, £22 10s.; deodorised, £25 10s. per ton. **Castor Oil**, pharmaceutical, 43s. per cwt.; firsts, 38s.; seconds, 35s. **Cod Oil**, f.o.r. or f.a.s., 25s. per cwt., in barrels. **Turpentine**, American, spot, 45s. 9d. per cwt.

Inventions in the Chemical Industry

Patent Specifications and Applications

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Complete Specifications Open to Public Inspection

PRODUCING A COMPOSITE SOLUTION, aqueous emulsion, or plastic composition, of bitumen and vulcanised rubber.—R. Riecke. Feb. 2, 1934. 22689/34.

WASHING, DETERGENT, AND SOFTENING AGENTS.—Chemische Werke Vorm. H. and E. Albert. Jan. 31, 1934. 26083/34.

CREAMING OF RUBBER LATEX.—United States Rubber Co. Jan. 31, 1934. 34729-30/34.

DESULPHURISING GASES.—Studien-und Verwertungs-Ges. Jan. 31, 1934. 2006/35.

AZO DYESTUFFS containing metals, and products resulting from this process, preparation.—Compagnie Nationale de Matieres Colorantes et Manufactures de Produits Chimiques du Nord Reunies Etablissements Kuhlmann. Feb. 2, 1934. 2236/35.

REMOVAL OF GASEOUS WEAK ACIDS from gases containing the same.—I. G. Farbenindustrie. Feb. 1, 1934. 2380/35.

DEOXIDATION OF ZINC.—Metamine Ges. Feb. 1, 1934. 2594/35.

AZO DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. Jan. 30, 1934. 2762/35.

TREATMENT OF TEXTILES.—Deutsche Hydrierwerke A.-G. Jan. 31, 1934. 3111/35.

ALBUMINOUS ARTIFICIAL MASSES, manufacture or treatment.—Deutsche Hydrierwerke A.-G. Jan. 31, 1934. 3228/35.

PROCESSES FOR FINISHING and softening cellulose products or articles.—Deutsche Hydrierwerke A.-G. Jan. 31, 1934. 3233/35.

QUININE COMPOUND, preparing.—H. P. Kaufmann. Feb. 3, 1934. 3285/35.

QUATERNARY AMMONIUM COMPOUNDS of benzimidazoles, manufacture.—Soc. of Chemical Industry in Basle. Feb. 1, 1934. 3335/35.

SIZING OF PAPER or paper pulp.—E. I. du Pont de Nemours and Co. Feb. 1, 1934. 3408/35.

PRODUCTION OF A MIXTURE of nitrogen and hydrogen by gasification of carbon under pressure.—G. Fauser. Feb. 2, 1934. 3453/35.

DEXTROSE, manufacture.—International Patents Development Co. Feb. 2, 1934. 3584/35.

WETTING AGENT FOR MERCERISING LIQUORS.—I. G. Farbenindustrie. Feb. 3, 1934. 3598/35.

AMINOPYRENESULPHONIC ACIDS, manufacture.—I. G. Farbenindustrie. Feb. 3, 1934. 3600/35.

COLOUR POWDERS, manufacture.—E. I. du Pont de Nemours and Co. Feb. 5, 1934. 3724/35.

PRODUCING COLOURED COLLOID LAYERS.—Dr. B. Gaspar. Aug. 10, 1933. 21718/35.

Specifications Accepted with Date of Application

AROMATIC HYDROCARBONS of low boiling-point by hydrogenating coal-tar fractions, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Dec. 9, 1933. 431,683.

WETTING-OUT PROPERTIES of materials, process for improving. C. Chapman and Monsanto Holdings, Ltd. Dec. 12, 1933. 431,645.

THERMAL TREATMENT of carbonaceous substances.—J. Y. Johnson (I. G. Farbenindustrie). Jan. 8, 1934. 431,519.

TEXTILE MATERIAL, process of treating.—I. G. Farbenindustrie. Jan. 10, 1933. 431,524.

PRESERVATION OF RUBBER.—Imperial Chemical Industries, Ltd., W. Baird and T. Birchall. Jan. 11, 1934. 431,577.

COLOURING ORGANIC SOLVENTS, lacquers, fats, oils, resins, waxes and products obtained therefrom.—I. G. Farbenindustrie. Feb. 25, 1933. 431,649.

DYESTUFFS, process for the manufacture.—I. G. Farbenindustrie. May 27, 1933. 431,652.

SAPONIFICATION OF FILAMENTS, threads, yarns, fabrics, and the like, having a basis of organic ester of cellulose.—H. Dreyfus. 431,701.

TEXTILE MATERIAL, process of treating.—I. G. Farbenindustrie. Jan. 14, 1933. 431,703.

ACID SAFRANINE DYESTUFFS, process for the manufacture.—I. G. Farbenindustrie. Jan. 14, 1933. 431,708.

SAFRANINE DYESTUFFS, process for the manufacture.—I. G. Farbenindustrie. Jan. 14, 1933. 431,709.

BROMINATED VAT DYESTUFFS, manufacture.—A. Carpmael (I. G. Farbenindustrie). Feb. 13, 1934. 431,654.

SUBSTITUTED PHENOLS, method of producing.—Röhm and Haas Co. March 28, 1933. 431,487.

CONDENSING MAGNESIUM VAPOURS, methods and apparatus.—Oesterreichisch Amerikanische Magnesit A.-G. April 7, 1933. 431,537.

CHROMIFEROUS DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. April 21, 1933. 431,598.

INDIGOID VAT DYESTUFFS, manufacture.—I. G. Farbenindustrie. June 8, 1933. 431,661.

PROCESS OF MERCERISATION.—Soc. of Chemical Industry in Basle. June 20, 1933. 431,662.

VALUABLE PRODUCTS, such as lubricating oils resistant to oxidation, transformer oils, and the like, process for the manufacture.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. July 15, 1933. 431,609.

ARTIFICIAL RESINS, process for the manufacture.—Dr. H. Hönel and Beck, Koller and Co., Inc., July 14, 1933. 431,495.

STERILISATION OF LIQUIDS.—Katadyn A.-G. Feb. 23, 1933. 432,101.

AZO DYESTUFFS, manufacture.—A. Carpmael (I. G. Farbenindustrie). Dec. 14, 1933. 432,020.

BLASTING CHARGE.—J. Taylor and Imperial Chemical Industries, Ltd. Dec. 15, 1933. 431,935.

SYNTHETIC RESINS and synthetic-resin varnishes and the manufacture thereof.—S. L. M. Saunders. Dec. 21, 1933. 432,103.

DEHYDRATING COPPER SULPHATE contaminated with organic materials.—H. A. M. Toledo. June 30, 1933. 431,859.

DIAMINOALCOHOLS OF THE AROMATIC SERIES, production.—Chemische Fabriken Dr. J. Wiernik and Co. A.-G. Jan. 12, 1933. 431,786.

SAPONIFICATION OF MATERIALS comprising organic esters of cellulose.—H. Dreyfus. Jan. 13, 1934. 432,027.

SAPONIFICATION OF CELLULOSE ESTERS.—H. Dreyfus. Jan. 13, 1934. 432,028-9.

TREATED PIGMENTS or fillers for rubber mixes, plastics, paints, and the like.—Pure Calcium Products Co., and A. H. Stevens. Jan. 15, 1934. 432,032.

NITROGENOUS CONDENSATION PRODUCTS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Jan. 16, 1934. 431,790.

TREATMENT OF CARBONACEOUS MATERIALS with hydrogenating gases.—H. E. Potts (International Hydrogenation Patents Co., Ltd.). Jan. 18, 1934. 431,795.

POLYNUCLEAR PHENOLS, manufacture.—E. I. du Pont de Nemours and Co. Jan. 19, 1933. 431,945.

CLARIFYING AND PRESERVING LIQUIDS containing colloids, process.—Katadyn A.-G. Jan. 19, 1933. 431,872.

LIQUID HYDROCARBONS, stabilisation.—E. I. du Pont de Nemours and Co. Jan. 20, 1933. 432,121.

AZO DYESTUFFS and their manufacture.—E. I. du Pont de Nemours and Co. Jan. 21, 1933. 432,122.

FIBROUS SHEET MATERIAL having a basis of partially hydrolysed cellulose, manufacture.—Soc. of Chemical Industry in Basle. May 12, 1933. 431,956.

ALKYLATED CYCLIC AMIDINES, manufacture.—Soc. of Chemical Industry in Basle. May 18, 1933. 431,808.

NITROGENOUS CONDENSATION PRODUCTS derived from phenols, manufacture.—Soc. of Chemical Industry in Basle. May 24, 1933. 432,143.

SEPARATING THE COMPONENTS OF ALLOYS of copper and silver, process.—A. L. Mond (I. G. Farbenindustrie). May 22, 1934. 432,144.

DETECTING IMPURITIES IN GASES, medium.—B. Dräger. May 24, 1933. 431,809.

CRYSTALLISATION.—Dorr Co., Inc. July 7, 1933. 431,812.

ETHYLENE OXIDE, manufacture.—Soc. Française de Catalyse Generalisee. July 10, 1933. 431,966.

PURIFICATION OF HYDROGEN for destructive hydrogenation.—H. E. Potts (International Hydrogenation Patents Co., Ltd.). July 21, 1934. 431,970.

DISTILLATION OF CARBONACEOUS MATERIALS, and apparatus therefor.—J. Lefevre. Aug. 12, 1933. 431,896.

SULPHURISED DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. Aug. 19, 1933. 431,976.

PRIMARY PHOSPHATES OF GLYCOCOL ALKYL ESTERS and N-alkyl derivatives thereof, manufacture.—A. Carpmael (Schering Kahlbaum A.-G.). Sept. 18, 1934. 432,155.

SYNTHETIC RESIN COMPOSITIONS.—S. L. M. Saunders. Dec. 21, 1933. 432,158.

FININGS FOR CLARIFYING LIQUIDS and means therefor, production.—C. F. Carpenter and Morrison, Carpenter and Co., Ltd. Nov. 13, 1934. 432,159.

PREGNANOLONES, production.—Schering Kahlbaum A.-G. Dec. 23, 1933. 431,833.

PURIFYING HYDROCARBON MIXTURES with removal of paraffin wax, process.—Edeleanu, Ges. Jan. 24, 1934. 432,168.

RECOVERY OF VOLATILE LIQUIDS.—G. Frenkel. March 5, 1935. 432,176.

DIAMINOALCOHOLS OF THE AROMATIC SERIES, production.—Chemische Fabriken Dr. J. Wiernik and Co. A.-G. Jan. 12, 1934. 431,848.

Applications for Patents

(July 18 to 24 inclusive.)

MANUFACTURING METALLIC SODIUM.—S. Abe and R. Hara. 20715.

VARNISHES, ETC.—British Glues and Chemicals, Ltd. 20562.

TITANIUM PIGMENTS, production.—British Titan Products Co., Ltd. (United States, July 19, '34.) 20484.

DYEING CELLULOSE ESTERS, ETC.—H. M. Bunbury, C. H. Giles and Imperial Chemical Industries, Ltd. 20612.

LIGHT-STABILISATION OF VINYL POLYMERS.—Carbide and Carbon Chemicals Corporation. (United States, July 31, '34.) 20451.

DYEING, ETC., ANIMAL FIBRES.—A. Carpmael (I. G. Farbenindustrie). 20643.

STABLE THERAPEUTICAL PRODUCT, manufacture.—A. Carpmael (I. G. Farbenindustrie). 20644.

AZO DYESTUFFS, manufacture.—A. Carpmael (I. G. Farbenindustrie). 20946.

SULPHURIC ESTERS OF HIGH-MOLECULAR ALCOHOLS, preparation.—Chemical Works, formerly Sandoz. (Switzerland, July 27, '34.) 21058.

BEET MOLASSES, fermentation.—Commercial Solvents Corporation. (United States, July 30, '34.) 20891.

UREAFORMALDEHYDE RESINS, manufacture.—Coutts and Co. (legal representatives of J. Y. Johnson) (I. G. Farbenindustrie). 20934.

DYESTUFFS.—Coutts and Co. (legal representatives of J. Y. Johnson) (I. G. Farbenindustrie). 20935.

COLOUR LAKES, manufacture.—Coutts and Co. (legal representatives of J. Y. Johnson) (I. G. Farbenindustrie). 20936.

CALCIUM-SULPHATE PLASTERS.—J. S. Dunn, F. R. Himsworth and Imperial Chemical Industries, Ltd. 21085.

INTERMEDIATES, ETC., manufacture.—E. I. du Pont de Nemours and Co. (United States, July 18, '34.) 20512, 20513.

STORAGE, ETC., OF HYDROGEN PEROXIDE SOLUTIONS.—E. I. du Pont de Nemours and Co. 20799.

CAST SYNTHETIC RESINS, production.—E. I. du Pont de Nemours and Co. (United States, July 24, '34.) 21081.

THERMOPLASTIC RESINS, manufacture.—E. I. du Pont de Nemours and Co. (United States, July 24, '34.) 21083.

SOLID STABLE SULPHURIC ACID ESTER SALTS of leuco vat dyestuffs, manufacture.—Durand and Huguenin. (Germany, July 21, '34.) 20803.

PROCESS FOR MAKING ALLOYS.—Electro Metallurgical Co. (United States, July 21, '34.) 20739.

STYRENE, polymerisation.—M. C. Field and C. O. L. Ward. 21060.

THIAZOLIDINE DERIVATIVES, manufacture.—W. W. Groves (I. G. Farbenindustrie). 20489.

AROMATIC AMINES, manufacture.—W. W. Groves (I. G. Farbenindustrie). 20490.

MONOBROMOPYRENE, manufacture.—W. W. Groves (I. G. Farbenindustrie). 21048.

QUININE COMPOUND, manufacture.—F. Hoffmann-La Roche and Co. (Germany, Aug. 18, '34.) 21054.

INDIGOID DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, July 18, '34.) 20491.

PHOTO-LUMINESCENT GLASS, manufacture.—I. G. Farbenindustrie. (Germany, July 21, '34.) 20810.

LOWER-BOILING HYDROCARBONS, production.—International Hydrogenation Patents Co., Ltd. (Oct. 30, '34.) (Germany, Nov. 18, '33.) 21006, 21007.

CARBOXYLIC ACID AMIDES, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 20675.

UNSATURATED CARBON COMPOUNDS, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 20729.

LIGHT HYDROCARBONS, recovery.—G. W. Johnson (I. G. Farbenindustrie). 20730.

DYESTUFFS, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 20731, 20732.

POLYHYDROXY COMPOUNDS, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 20733.

AZO DYESTUFFS, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 20937.

HYDROGEN PEROXIDE, manufacture.—F. Krauss. (Dec. 12, '34.) 20783.

CRACKED HYDROCARBON DISTILLATES, treatment.—A. L. Mond (Universal Oil Products Co.). 20508.

BENZINES, production.—H. E. Potts (International Hydrogenation Patents Co.). 20860.

AZO DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. (Switzerland, July 21, '34.) 20804. (Switzerland, July 15.) 20805.

CONVERSION OF ETHERS to alcohols.—Standard Oil Development Co. (United States, Dec. 28, '34.) 20780.

From Week to Week

BRITISH CARBO-UNION, LTD., have changed their address to 16 Queen Anne's Gate, London, S.W.1. Telephone No.; Whitehall 8271. Telegraphic Address: Bricarbun, Parl, London.

THE NOMINAL CAPITAL of Aluminium Sulphate, Ltd., 95 Gresham Street, London, E.C.2, has been increased by the addition of £4,000 in £1 deferred shares beyond the registered capital of **£30,000.**

MEMBERS OF THE INSTITUTE OF BREWING will visit Kentish hop gardens and kilns on Friday, September 13. Tea will be taken at the East Malling Research Station, by kind invitation of the Director.

NORWEGIAN WHALING COMPANIES strongly oppose the alleged plan of Unilever, Ltd., to build two or three whaling factories in Norway. The association of whaling companies and Norwegian municipalities interested in the whaling industry have sent telegrams to the Government asking it to fight these plans by all legal means.

DEVELOPMENTS IN EXPLOITING South African mineral resources may be expected soon, and the Government is considering how this can be effected, according to a statement made by General Smuts, the South African Deputy-Premier. South African shale is very rich in oil and a large oil industry could arise with Government support and sympathy. Asked whether the Government intended doing anything in the way of extracting oil from coal, the Deputy-Premier said: "We are awaiting the completion of the British experiment conducted by Imperial Chemical Industries at Billingham."

I.C.I. (GENERAL CHEMICALS), LTD., has asked the Widnes Gas Department to take into consideration the question of treating the whole of the company's Widnes works as a single unit for the supply of gas for industrial purposes in order that the company might enjoy to a greater extent than at present the rebate made to large consumers. The committee has resolved that the works be re-grouped for the purposes of gas supply as follows: 1, Gaskell-Marsh Works; 2, Pilkington-Sullivan Works; 3, Central Laboratory. Each group to be treated as a separate consumer. It was stated at the Town Council meeting that there were 17 units previously for the payment of gas by I.C.I. and the consumption of gas was 14,730,000 cubic feet. If they were all brought under one unit it would mean a rebate of £121 per annum. That would be a gain to the I.C.I. and a loss to the Gas Department. The proposed arrangement would mean a loss to the department of £42.

WM. GARDNER AND SONS (GLOUCESTER), LTD., are exhibiting at the forthcoming Bakers' and Confectioners' Exhibition, and also at the Grocers' Exhibition at the Royal Agricultural Hall, Islington.

ALL THE GENERALISED INFORMATION ABOUT COPPER, which the ordinary user is likely to need, has been collected and issued in the form of a convenient engineers' notebook by the Copper Development Association, Thames House, Millbank, London, S.W.1, from whom copies can be obtained free of charge on application.

"DRY ICE," which has up to now appeared in German only, under the title "Das Trockeneis," is being published in English as from July, 1935. This journal is already in its fourth year of publication, and is the only organ of this kind in the world that deals exclusively with questions concerning dry ice. It is edited by the Dry Ice Advisory and Press Service, and is the organ of the Research Society for the Application of Dry Ice, Sigmaringen, Germany.

A RENEWAL OF THE INTERNATIONAL NITRATE CARTEL PACT between Chile and the synthetic producers is now virtually assured. The old agreement expired on June 30, and the new agreement will be for a term of three years, subject to withdrawal rights by participants at the end of two years. Quotas covering the various producers have been agreed, and progress has been made with price-fixing. It is understood that Chile will receive an annual export quota of over 1,250,000 tons, an increase of 50,000 tons on the amount exported last year.

THE BI-ANNUAL CONFERENCE of the International Society of Leather Trades' Chemists, in conjunction with that of the Internationalen Vereins der Leder Industrie Chemiker, will be held from September 1 to 6 at the Institut des Arts et Metiers, 50 Boulevard de l'Abattoir, Brussels, Belgium. The reception of members and visitors will take place on the Sunday evening, September 1, at 8 p.m., at the Palace Hotel, Place Rogier, while the official banquet is fixed for Wednesday, September 4, at which the Burgomaster of Brussels will be present, together with other

representatives of civic, commercial, and scientific bodies. Further details can be obtained from M. A. Fieves, 7 rue d'Audiger, Soignies, Belgium, or from the Hon. General Secretary of the I.S.L.T.C., 17 Market Street, London, S.E.1.

CONSIDERABLE DAMAGE WAS CAUSED by fire which broke out on August 13 at the salt works in Tolbooth Street, Kirkcaldy, belonging to R. and D. Gibb. The fire broke out near the furnaces, the roof and part of the sides of a wooden drying shed being destroyed. Kirkcaldy Fire Brigade succeeded in saving the major portion of the works, the salt pans being undamaged.

BRITISH BEMBERG, LTD., the rayon manufacturers, will hold an extraordinary meeting on September 3 for the purpose of considering a reorganisation of capital. It is proposed to reduce the capital to £450,000, from £1,250,000 by cancelling 4s. of each of the issued 4,000,000 5s. shares, reducing the nominal value to 1s. It is then proposed to consolidate the 1,000,000 unissued 5s. shares into £1 shares, to rank *pari passu* with the 1s. share. There will then be created 800,000 additional £1 shares to rank *pari passu* with those mentioned above and with the 1s. shares. Thus the capital will be brought back to £1,250,000. This arrangement is necessitated by the situation revealed in the last report, and it will enable capital not represented by available assets, or which has been lost, to be cancelled. The report for 1934, issued in June last, showed a loss of £43,299 after debenture interest, etc., which increased the total debit to £288,250.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Hong Kong.—A manufacturers' representative known to be interested in obtaining agencies for building materials desires, in addition, the agencies of manufacturers of heavy and industrial chemicals. He is at present on a visit to the United Kingdom. (Ref. No. 163.)

New Companies Registered

Amalgamated Industries, Ltd., Uxbridge Road, Hillingdon, Middlesex.—Registered August 12. Nominal capital £1,000. Manufacturers of and dealers in chemicals, gases, drugs, medicines, plaster of Paris, gypsum, plasters, disinfectants brushes, toilet requisites, etc.

Ion Chemical Co., Ltd., 187a West George Street, Glasgow, C.2.—Registered in Edinburgh August 3. Nominal capital £250. Wholesale and/or retail manufacturing and agricultural chemists, manure merchants, corn factors, feeding stuff merchants, etc. Directors: James S. Millar, Swan Farm, Gourock, William W. Murdoch.

Company News

Limmer and Trinidad Asphalte Co.—The directors have declared an interim dividend of 6 per cent. on both the participating preference and ordinary shares, payable on September 7 next.

Eastman Kodak Co.—The payment is announced of regular dividend of 1½ per cent. on preferred stock; regular dividend of $1.25 per share on common stock; extra dividend of $0.25 per share on common stock.

Frederick Braby.—The profit to June 30 was £50,901, plus £2,529 brought in. To depreciation is placed £11,854, to interim on preference and employees' shares, £5,235, final on preference and employees' shares, £5,235, dividend of 7 per cent. on ordinary, £21,429, leaving to go forward £9,677.

Reckitt and Sons, Ltd.—A second quarterly interim dividend of 5 per cent. has been declared. This makes a total of 10 per cent. paid so far in respect of the current year. For the past four years interim dividends totalling 15 per cent. have been followed by final distributions of 7½ per cent., including a 1¼ per cent. bonus. Payment will be made on October 1, together with the quarterly dividend and interest on the 4¼ per cent. and 5 per cent. preference shares and the 4 per cent. debenture stock.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BRITISH OIL AND CAKE MILLS, LTD., London, E.C. (M., 17/8/35.) Reg. July 31, charge supplemental to trust deed dated Oct. 3, 1899; charged on land and buildings at South Hamlet, Gloucester. *£598,000. Apr. 9, 1935.

Books Received

Molybdenum Steels. By Julius L. F. Vogel and W. F. Rowden. Widnes: High Speed Steel Alloys, Ltd. Pp. 104. 5s.

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